Risk Assessment of Diesel-Fired Back-up Electric Generators Operating in California

Prepared for

Environmental Defense
Oakland, California

August 2002

Prepared by

Julian D. Marshall
Energy and Resources Group
University of California
Berkeley, California

and

William W. Nazaroff, Ph.D.
Professor of Environmental Engineering
Department of Civil and Environmental Engineering
University of California
Berkeley, California

Acknowledgements

Kate Larsen, a research associate with Environmental Defense, contributed to the report through background research, data management and analysis, and document preparation. The authors thank her for her hard work and dedication.

The authors would like to thank the California Air Resources Board for comments and suggestions on an earlier draft of this work.

Howard Gebhart and Jessica Karras-Bailey of Air Resource Specialists, Inc., completed the air dispersion modeling used in this report. The authors thank them for sharing various details on how the Industrial Source Complex (ISC) model is implemented in typical permitting situations.

During earlier stages of this investigation, George Lucier, a private consultant formerly employed as a toxicologist at Environmental Defense, contributed to our understanding of the toxicity of various hazardous air pollutants in diesel emissions.

Wayne Miller, the Director of the Emissions and Fuel Research Laboratory at U.C. Riverside's College of Engineering Center for Environmental Research and Technology (CE-CERT), clarified how emission factors are measured in the field.

Last but not least, the authors would like to thank Garvin Heath for his contributions during several fruitful discussions on diesel back-up generators and, more broadly, the environmental health impacts of electricity generation. Garvin is a graduate student in the Energy and Resources Group and in Environmental Engineering, both at U.C. Berkeley.

The authors thank all of the people who contributed to this report directly and indirectly. Any mistakes contained herein are our own.

Table of Contents

1.0 Introduction and Summary of Findings

Diesel generators are used as a back-up source of electricity. In California, there are over 11,000 diesel-fired back-up generators, totaling roughly 5,000 megawatts (MW) of capacity. Environmental Defense (ED) is undertaking a study of the potential health effects that would be associated with increased operation of these back-up generators (BUGs). The study focuses on increased human health risks that would result from exposure to diesel emissions. The study has four components:

- Development of a Geographic Information System (GIS) database combining the California Energy Commission (CEC) BUG inventory with layers of data on land use, demographics, and existing exposure to diesel emissions.
- Mapping and geo-statistical analyses to assess the extent to which sensitive and/or disadvantaged populations face disproportionate increases in health risk from increased utilization of BUGs.
- Dispersion modeling to quantify the potential increases in air pollution exposure resulting from operating diesel-fired BUGs.
- Analysis of the health effects of modeled diesel emission exposures.

This report documents the studies performed to assess the public health impact of BUG emissions. It incorporates the results of air dispersion modeling performed by a separate consulting firm, Air Resource Specialists, Inc. (ARS), located in Fort Collins, Colorado.

Based on our analysis of available information on the dispersion of emissions from diesel-fired back-up generators (BUGs) and on the toxicity of BUG emissions, we arrive at the following conclusions:

- Elevated ambient levels of particulate matter (PM), especially PM with a diameter of 2.5 micrometers or less (PM2.5), are associated with an overall increased risk of mortality. The mortality risk associated with PM2.5 emissions is the most significant public health impact of BUG emissions.
- Of the three types of public health effects typically considered for toxic air contaminants — acute, chronic non-cancer, and chronic cancer — the chronic cancer risk due to diesel particulate matter (DPM) presents the largest concern associated with BUG emissions.
- The general mortality risks associated with PM2.5 emissions from BUGs are about an order of magnitude larger than the chronic cancer risk associated with DPM emissions.
- Chronic cancer risks owing to DPM exposure exceed acceptable levels at distances of a few hundred meters or more downwind of the BUG. The size of the chronic cancer "risk zone" depends on several factors, the most important of which is the number of hours of operation.
- Diesel engine exhaust is included on the State of California's list of chemicals that are known to cause cancer. Under the state's Proposition 65 law, businesses are required to warn people

before exposing them to carcinogens at risks exceeding 10 per million. Emissions from a BUG may trigger this requirement.

- Given existing background concentrations of PM10 in urban areas in California, it is likely that BUG emissions will cause localized exceedances of the State of California's 24-hour ambient PM10 concentration standard of 50 micrograms per cubic meter.

- In this report, we have investigated hypothetical BUGs with typical attributes. The actual impact of an individual BUG will depend on individual technical specifications and local environmental conditions. For example, factors such as power output by the BUG or the effects of buildings in the vicinity of the BUG can influence emissions, dispersion and exposures.

- Because the scientific understanding of air dispersion during low wind speed conditions is incomplete, the true impact of BUGs may be greater than is predicted by air dispersion models. The model used by ARS for this study and typically used for air pollution health-risk evaluations, the Industrial Source Complex (ISC) model, does not predict concentrations during calm conditions. We find that calm conditions prevail an average of 5-20% of the time in major urban areas in California. Because the frequency of occurrence is substantial and because exposures may be significantly higher during calm conditions, one cannot draw firm conclusions about the health impact of BUGs without better understanding exposure under calm conditions. Results based on approximate methods indicate that the concentrations of diesel emissions in the vicinity of BUGs during calm hours may be considerably higher than during non-calm hours.

The remainder of this report is divided into the following sections: Methods, Results, Low Wind Speed (Calm) Conditions, Intake Fraction, Uncertainties and Limitations, Conclusions, and a List of Abbreviations. Additional details on our analyses and results are contained in the appendices.

In the Methods section we describe how results from air dispersion modeling are combined with toxicological information to estimate the environmental health risks imposed by BUGs. In the Results section we present and discuss our findings, using a conventional risk assessment framework. In the section on low wind speed (calm) conditions, we indicate why calms are important to the risk assessment process, and why it is necessary to augment the ISC model with an approach that addresses calm hours. In the Intake Fraction section we present a novel metric for quantifying the population-wide intake of emissions from air pollution sources and apply it to develop an alternative estimate of the environmental health significance of BUGs. Finally, we discuss limitations and uncertainty in our analysis, and conclude with a summary of our findings.

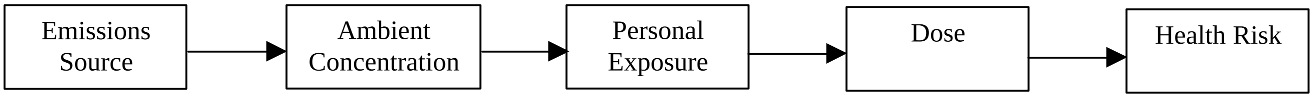
Appendices 1 and 2, respectively, contain the model inputs and outputs. Toxicological information is also included in Appendix 1. Appendix 3 presents an estimate of the concentrations that may be expected during calm conditions and shows how often calm conditions occur in the meteorological data. Appendix 4 provides a population-wide exposure assessment using an intake fraction approach, and converts the population intake to estimates of the population chronic cancer and mortality risk.

2.0 Methods

For toxic air contaminants emitted from diesel BUGs, the health risk can be estimated as the product of three terms: (1) the quantity of contaminant released; (2) the increase in exposure concentration per unit release; and (3) the risk of adverse effect per unit increase in exposure concentration. The first term is determined by multiplying an emission factor times the amount of engine use. The emission factor indicates the amount of pollutant emitted per unit of engine use. Air dispersion models are used to evaluate the second term, based on information about emission characteristics and meteorology. The third term is addressed by toxicity values, which account for acute, chronic cancer, and chronic non-cancer effects, respectively. These three components – emissions factors, air dispersion modeling, and toxicity information – are described in more detail below.

The three terms above summarize a more general framework, presented in Figure I, for evaluating risk from sources of environmental contaminants.

Figure I. General Framework for Evaluating Environmental Health Risks



2.1 Emission Factors

Emission factors indicate the mass of emissions that will occur per amount of BUG activity. Emission factors (EFs) for the evaluations presented here were taken from the EPA's compilation of emission factors, known as AP-42[1]. Two common units for diesel engine emission factors are grams of pollutant emitted per horsepower-hour of electrical power generated by the engine (g/hp-h), or pounds of pollutant emitted per million BTU heat energy of fuel consumed (lb/MMBTU). The conversion[2] between these two units is 3.178 g/hp.h = 1 lb/MMBTU.

AP-42 provides separate EFs for large and small engines. Large engines are defined as having a generating capacity of greater than 600 hp, and small engines are defined as having a generating capacity of less than 600 hp. EFs for particulate matter with a mean diameter of 10 micrometers or less (PM10), in pounds per million BTU, are listed in AP-42 as 0.31 and 0.1, for small and large engines, respectively. Essentially all of the diesel particulate emissions are expected to be smaller than 2.5 micrometers in diameter. Thus, for this investigation the

---

[1] AP-42 is available on-line at http://www.epa.gov/ttn/chief/ap42/.

[2] Because MMBtu refers to heat energy in, while hp-hr refers to energy produced by the engine, a conversion of 7000 Btu/hp-h, or 0.007 MMBtu/hp-h, is used to account for both the unit conversion and for the efficiency of the engine. See AP-42, Vol. 1, Ch. 3.3, page 6. Also, note that the term brake horsepower (bhp) refers to the technique used to determine an engine's horsepower. In this report bhp and hp are used interchangeably.

following terms may be considered to be synonymous: diesel particulate matter (DPM), diesel PM10, and diesel PM2.5.

The AP-42 compilation represents the most comprehensive listing of emission factors available, and because EPA prepares the information, it is the most widely accepted source of emissions factors for regulatory purposes. Manufacturers' information is a second potential source for emissions factors, but this source is not applicable in this context since we are looking at BUGs in general rather than a specific engine type, brand, and make. AP-42 is the most appropriate source for information on EFs, and to our knowledge it represents the most accurate information available.

As we discuss below, the concentrations predicted by air dispersion models are proportional to emissions. Therefore, if improved EF information becomes available in the future, it is possible to scale the concentration results accordingly. In order to test the importance of the EF to our conclusions, we performed a sensitivity analysis for some of our analyses, wherein we applied the large engine EF to the small engine, and applied the small engine EF to the large engine. We also applied an EF of 0.55 g/bhp-h to all engines sizes, based upon ARB staff’s estimate that typical BUGs in California have an EF of 0.5-0.6 g/bhp-hr. The results from this sensitivity analysis, presented in Section 6.0 and Appendix 2-7, suggest that excess cancer cases and PM mortality are not as sensitive to the EF as might be expected. When we switched the large and small emission factors, the risk numbers increase by roughly 30 percent, and when we used the emission factor suggested by the ARB, the numbers did not change significantly.

2.2 Air Dispersion Modeling

The impact of diesel engines on nearby populations is presented in terms of predicted ambient concentration increases owing to atmospheric emissions from a single diesel back-up generator (BUG). Environmental Defense contracted with a separate consultant, Air Resource Specialists (ARS), to conduct the air dispersion modeling. Their methods and results for a 500 hp BUG are summarized briefly below and more substantially in Appendix 2. The reader is referred to their report for a more detailed description of their work.

ARS used a standard air dispersion model, Industrial Source Complex (ISC)[3]. ISC is a regulatory-approved model typically used to determine the impact of emissions on the surrounding community, such as for permitting new sources.

In the present application, ISC models the following processes. Gaseous emissions from a BUG are initially buoyant because they exit the exhaust stack at a certain velocity and temperature. As the exhaust gas mixes with the surrounding air, the temperature and velocity come into balance with the local environment. Concurrently, the emissions are transported downwind, and turbulent diffusion causes the emissions plume to spread vertically and horizontally. This spreading, or mixing, dilutes the emissions, thereby decreasing the concentration while spreading it over a larger volume.

---

[3] ISC is available on-line at http://www.epa.gov/ttn/scram/.

Using the Gaussian plume dispersion equations, ISC tracks the ground-level concentration at a grid of discrete receptor points in the vicinity of the source. The degree of mixing, and therefore the downwind concentration, depends on the specific meteorological conditions, such as the atmospheric stability and wind speed. Atmospheric stability determines the rate of vertical mixing in the atmosphere. Unstable conditions, which are induced by uneven heating of the lower atmosphere, lead to more rapid vertical mixing.

The primary influence of wind speed is to determine how rapidly clean air dilutes the emissions. Wind speed also influences downwind concentrations in other ways. For example, wind speed is inversely related to plume rise because under low-wind conditions, the emissions' initial buoyancy and inertia will carry the plume higher into the air than during high-wind conditions. Furthermore, the stability of the air depends in part on the wind speed. High wind speeds during the day or night promote neutral stability because strong turbulent mixing of the air counteracts uneven heating or cooling. Low wind speeds coupled with clear skies during the day permit unstable conditions to develop, because of intense ground heating. In contrast, these same circumstances during the nighttime permit stable conditions to develop owing to radiative cooling of the ground.

Meteorological data are recorded every hour, so ISC can estimate hourly average concentrations at each receptor location for each of the 8760 hours in a year. The meteorological data[4] used by ARS are discussed below and in Appendix 3.

Using the Gaussian dispersion equations, as is done in ISC, the downwind concentrations are linearly proportional to the emissions. This means that, ceteris paribus, a doubling of the emissions will lead to a doubling of the concentration downwind. Because of this, it is possible to use one ISC model run for multiple pollutants by modifying the output concentrations according to the relative emission rates. Similarly, if new information should become available in the future, such as an updating of the existing EFs, it would be possible to adjust the concentration results using the proportional change between the old and the new EFs.

ARS conducted air dispersion modeling using meteorological data for five cities — San Diego, San Francisco, Fresno, Los Angeles, and Sacramento. Five years of meteorological data were used for each city. Because we are modeling a generic BUG, we know that it will run only a small proportion of hours each year, but we do not know when these hours will occur. Here, we assume that each BUG runs a total of 50, 100, 200, 500, or 1000 hours per year. Although operation for more than 200 hours a year is not typical of most BUGs, unauthorized use of BUGs could potentially result in annual operations for such high periods.

We have devised three scenarios under which the hours of operation are allocated randomly, as summarized below. These different scenarios can influence the results because the meteorological conditions that affect downwind concentrations vary with season and time of day.

- In the **all** scenario, BUGs can operate at any time and any day of the year. Thus, BUG use is randomly allocated to a fixed number of operating hours, selected from among 24 hours per day and 365 days per year (8760 possible hours).

---

[4] Meteorological data are available on-line from the EPA's SCRAM database at http://www.epa.gov/ttn/scram/

- In the **business** scenario, BUGs only operate between 7 am and 7 pm. Thus, BUG use is randomly allocated to a fixed number of operating hours, selected from among 12 hours per day and 365 days per year (4380 possible hours).
- In the **summer** scenario, BUGs only operate between 12 noon and 6 pm during the months of June, July, August, and September. Thus, BUG use is randomly allocated to six hours per day, 122 days per year (732 possible hours).

ISC model results are expressed in terms of the highest 1-hour concentration, the highest 24-hour concentration, and the annual average concentration[5]. Results are summarized in Appendix 2, and detailed in a report from ARS to Environmental Defense.

2.3 Toxicity

The toxicity of a chemical indicates the risk of an adverse health outcome occurring because of exposure to that chemical. The three health risks that are typically considered in a health-risk assessment for toxic air contaminants, and that have associated toxicity values, are *acute*, *chronic cancer*, and *chronic non-cancer* risks. In addition to these risks, we have estimated direct mortality effects due to PM2.5 using recent epidemiological evidence.

Based on our analysis, we conclude that the direct mortality risk poses the single largest concern for the health effects of diesel BUG emissions. Of the three health risks typically considered in a risk assessment for hazardous air pollutants (acute, chronic cancer, and chronic non-cancer), chronic cancer risk constitutes the largest public health concern.

Toxicity values for selected pollutants for acute, chronic cancer, and chronic non-cancer risks are listed in Appendix 1 and discussed below in sections 2.3.1 and 2.3.2. These values have been peer-reviewed and approved by regulatory agencies. They are designed to be protective of the public health, meaning that they should include a margin of safety to protect children, the elderly, and the infirm.

The toxicity value for direct mortality risk is taken from peer-reviewed literature for population-wide exposure, as summarized in an article by the Chairman and the Chief Deputy Executive Officer of the California Air Resources Board. The risk factor for this health endpoint is discussed in section 2.3.3.

2.3.1 Acute toxicity

Acute health risks are those that result from short-term exposure, typically defined as less than 14 days, whereas chronic health risks are associated with long-term exposures, typically defined as longer than three months. The toxicity for acute and chronic non-cancer is typically expressed in terms of a threshold concentration that should not be exceeded during a specified exposure period. The acute and chronic non-cancer risk is often presented as a Hazard Index (HI), which is the estimated exposure concentration divided by the threshold concentration. For

---

[5] The annual averages in this report are the average of five annual averages (from five years of meteorological data).

example, a HI of two indicates that the estimated exposure concentration is twice the threshold concentration.

The acceptable threshold concentrations for acute toxicity are given by the Acute Reference Exposure Levels (acute RELs) maintained by California's Office of Environmental Health Hazard Assessment (OEHHA). The Hazard Index for acute toxicity is computed by dividing an exposure concentration by the corresponding acute REL.

To understand the significance of the 1-hour maximum concentration results predicted for BUGs, the maximum hourly concentrations for acrolein are presented in Appendix 2 in terms of the corresponding Hazard Index. Among those chemicals for which both emission factors and REL values are available, the chemical with the most stringent acute concentration limit for BUGs is acrolein. We determined this by comparing all chemicals for which we have an emission factor and an acute REL, and choosing the one with the highest EF/REL ratio (see Appendix 1).

To determine the risk of an adverse outcome owing to BUG operations, it is necessary to have both the EF and the REL for each chemical. One of the limitations of the available data is that there are chemicals for which only one of these two values exist (e.g., there are EFs for sixteen individual polycyclic aromatic hydrocarbons (PAHs) and for total PAHs, but there are no RELs for any of them individually or in sum).[6] This lack of an REL for total PAHs does not imply that the OEHHA has concluded that PAHs are non-toxic. Rather, it is more likely that OEHHA has not yet had the time and resources to make a decision based on a thorough review of available evidence, or that insufficient evidence is available to make a robust determination of the acute toxicity.

2.3.2 Chronic cancer and non-cancer risks

Toxicity for chronic cancer risk is typically expressed in terms of the lifetime risk of excess cancer cases per unit exposure concentration. This value is multiplied by the estimated exposure concentration to obtain the incremental cancer risk. For example, if the average concentration increase of a certain chemical owing to emissions from a given source is 2 micrograms per cubic meter ($\mu g/m^3$), and the toxicity is 3 per million per $\mu g/m^3$, then the risk from that source is estimated to be 6 per million. This is interpreted to mean that if one million people were exposed to the given concentration for the duration of their 70-year lifetimes, we would expect six people to contract cancer because of their exposure to this chemical from this source.

To determine whether a risk is large or small, one compares the estimated risk to respective benchmarks. One benchmark is a risk level that is small enough to be considered insignificant, or "de minimis." This benchmark for chronic cancer risk is based on the 1990 Clean Air Act, which allows sources to be exempt from regulation and residual risk to be considered negligible when posing less than a one in a million risk to the most exposed

---

[6] In addition, there may be other toxic chemicals emitted from BUGs for which neither an emission factor nor a toxicity factor has been developed.

individual.[7] CalEPA defines the de minimis level to be one per million or less for chronic cancer risks, and an HI of 0.2 or less for acute and chronic non-cancer risks. CalEPA considers an HI greater than 10 to be sufficient grounds for denial of an emissions permit for regulated emission sources. A chronic cancer risk greater than 10 times the de minimus level, or 10 per million, is large enough to warrant risk reduction actions. A risk greater than 100 times the de minimus level, or 100 per million, may be significant grounds for denial of a permit.[8]

Comparing all of the values for chronic cancer and chronic non-cancer toxicity in Appendix 1, the most stringent constraint is the cancer risk for the diesel particulate matter (DPM). The cancer risk potency of DPM, given in Table 1-6 [9], is 300 per million per $\mu g/m^3$. This means that chronic exposure to one $\mu g/m^3$ would yield a lifetime excess cancer risk of 300 per million, i.e. 300 times the de minimus risk level. The incremental increase in chronic exposure concentration must be less than 0.0033 $\mu g/m^3$ to be below the de minimus risk level. The chronic non-cancer REL for diesel exhaust, given in Table 1-6 as 5 $\mu g/m^3$, is more than 1000 times less stringent than the de minimus chronic cancer risk concentration of 0.0033 $\mu g/m^3$. When comparing the emission factor to the chronic REL for various constituents of diesel exhaust, the result for PM is much larger than for any specific chemical compound (acrolein is next highest).[10] Therefore our analysis indicates that the chronic cancer risk is far greater than the chronic non-cancer risk, and we have not focused on the chronic non-cancer risk in this report. A separate concern, addressed in the next section, is the potential risk of increased mortality directly associated with particulate matter exposure.

2.3.3 Mortality risk

Because most PM emissions from diesel engines are smaller than 1 μm in diameter, it is appropriate to consider all DPM as PM2.5. Recent evidence – summarized by Lloyd and Cackette (2001)[11] – concludes that the largest public health concern for PM2.5 is from the mortality risk. Furthermore, current research[12] indicates that the risks from PM2.5 may be even higher than was previously thought.

---

[7] In some instances even a chronic cancer risk less than one per million may not be considered insignificant. For example, the ARB's Risk Management Guidance for the Permitting of New Stationary Diesel–Fueled Engines (http://www.arb.ca.gov/diesel/documents/rmg.htm) recommends best available control technology be applied if the risk is greater than or equal to one in a million and reasonably available control technology be applied when the risk is less than one in a million.

[8] Risk Assessment Advisory Committee (1996) *A Review of the California Environmental Protection Agency's Risk Assessment Practices, Policies, and Guidelines*, Published by the Office of Environmental Health Hazard Assessment, California Environmental Protection Agency, p. A-4.

[9] For consistency, the cancer risk values in Table 1-6 are in units of $(mg/m^3)^{-1}$. The value for diesel exhaust is 0.3 $(mg/m^3)^{-1}$, which is equivalent to 300 $(\mu g/m^3)^{-1}$.

[10] For small diesel engines, the EF/Chronic REL ratio for PM is 28,000 (units: mg/MMBtu per $\mu g\ m^{-3}$), and this is the most stringent (i.e., highest) ratio. Using the same units, the highest EF/Chronic REL ratio for a specific chemical compound is 700 for acrolein.

[11] Lloyd AC and Cackette TA. Diesel Engines: Environmental Impact and Control. June 2001. Journal of the Air and Waste Management Association 51:809-847. For a more detailed look at the health effects of diesel, the reader may wish to review an analysis by the ARB and OEHHA, entitled "Review of the California Ambient Air Quality Standards For Particulate Matter and Sulfates," Public Review Draft, November 30, 2001. As this latter document is currently in the "draft" stage, is it not appropriate to quote from it, and we do not use it in our analysis.

[12] Pope *et al*. Lung Cancer, Cardiopulmonary Mortality, and Long-term Exposure to Fine Particulate Air Pollution. *Journal of the American Medical Association*. 2002; 287:1132-1141. While Lloyd and Cackette (2001) only provide estimates of total mortality, Pope *et al*. provide results based on the cause of death. Their four categories for

Lloyd and Cackette (2001) base their estimates of the toxicity of DPM on studies that have investigated the link between ambient PM and population mortality. Given the size and chemical composition of DPM, we would expect DPM to be more toxic than ambient PM2.5. Thus, while the studies that Lloyd and Cackette cite probably represent the best available evidence of DPM toxicity, the values they use are based on studies of ambient PM2.5, and they therefore may underestimate the true toxicity of DPM.

Lloyd and Cackette provide four estimates of the short-term mortality and two estimates of the long-term (one-year) mortality attributable to direct (primary) DPM concentrations[13] of 1.8 $\mu g/m^3$. Each estimate is presented in terms of the mean, 5th percentile and 95th percentile value, with means for short-term effects spanning the range 665 to 2531 deaths/year, and mean values for combined short- and long-term effects[14] of 2880 and 3566 deaths/year. Because BUGs are installed to operate intermittently over periods of many years, it is appropriate to consider the combined short- and long-term effects of DPM exposure. We used the higher of the two mean values from Lloyd and Cackette (3566 deaths/year)[15] for estimating direct mortality effects in Appendix 4. Even this value may underestimate the toxicity of DPM, because these toxicity values are for ambient PM2.5 rather than DPM.

PM2.5 may be even more toxic than was thought at the time that Lloyd and Cackette (2001) completed their review article, and recent research[16] indicates a PM2.5 toxicity value approximately twice the value in Lloyd and Cackette (2001). Nevertheless, we have used the results from Lloyd and Cackette (2001) because they are more comprehensive and compare several studies.

---

cause of death are all causes (i.e., total mortality), lung cancer, cardiopulmonary, and all causes other than lung cancer and cardiopulmonary.

[13] Lloyd and Cackette estimate that each 1.8 $\mu g/m^3$ of direct (primary) PM2.5 corresponds to 0.81 $\mu g/m^3$ of indirect (secondary) PM2.5 nitrate formation attributable to NOx emissions. Thus, the combined health effects due to primary and secondary PM2.5 are 45% greater than the health effects of only primary PM2.5. The health effects presented here as attributable to each 1.8 $\mu g/m^3$ of direct PM2.5 are the combined effects of direct and indirect PM2.5. Note that while the present report focuses on diesel BUGs, Lloyd and Cackette look at all diesel engines in aggregate, including on-road, off-road, and stationary diesel engines. By using their results, we are implicitly assuming that the formation of secondary PM2.5 nitrate calculated by Lloyd and Cackette for all diesel engines applies to diesel BUGs. This will only be correct if the ratio of PM emissions to NOx emissions is the same for BUGs as for the diesel engines considered by Lloyd and Cackette. This is not necessarily the case. If the NOx-to-PM ratio is significantly higher for BUG engines than for those engines considered by Lloyd and Cackette, there will more secondary PM2.5 formed by BUGs than Lloyd and Cackette calculate. Similarly, if the NOx-to-PM ratio is significantly lower for BUGs than for those engines considered by Lloyd and Cackette, then less secondary PM2.5 will be formed by BUGs than Lloyd and Cackette calculate. Detailed analyses of the PM-to-NOx ratio for BUGs and other engines, and of secondary PM2.5 nitrate formation from NOx emissions from BUGs, is beyond the scope of this work. The EPA's compilation of emissions factors, called AP-42, does not distinguish between the end use of the diesel engine (e.g., BUGs versus on-road engines), implying that differences between engine uses (i.e., diesel BUGs versus other diesel engines) are not overly important. If information becomes available in the future on secondary PM2.5 formation specifically attributable to emissions from BUGs engines, it would not be difficult to update our work.

[14] Lloyd and Cackette label the combined short- and long-term effects as "long-term exposures mortality," and then point out in a footnote that this category includes both short- and long-term effects.

[15] Note that the value we used (3566 deaths/year) is lower than the 95th percentile estimates, which were 4341 and 5257 deaths per year, respectively, for the two long-term studies.

[16] Pope *et al.* op. cit.

Based on the estimated health outcome of 3566 deaths/year in California owing to average ambient levels of 1.8 µg/m^3 of direct DPM, and a state population of 33 million, we estimate a toxicity of 57 deaths per year per million people per µg/m^3. Note that this risk[17] is in addition to the other effects calculated elsewhere in this report (e.g., the chronic cancer risk).

An important difference between the mortality risk and the chronic cancer risk is that the former is calculated based on a 1-year exposure scenario, while the later is calculated based on a 70-year exposure scenario. While the PM2.5 risk value of 57 per year per million people per µg/m^3 appears to be about five times lower than the DPM chronic cancer toxicity (300 per million per µg/m^3), the former occurs after only 1/70th of the exposure, and thus after only 1/70th of the intake. Therefore the direct mortality risk is estimated to be 13 times higher than the chronic cancer risk.

Unlike the REL toxicity values, which are designed to be protective of sensitive sub-populations, the toxicity values used in Lloyd and Cackette (2001) represent the risk to the general public. The risks to sensitive sub-populations will be even greater than is presented in this report. For diesel PM, we expect the list of sensitive sub-populations to include young people, the elderly, and the infirm.

Insufficient information exists to determine whether the mortality risk attributable to DPM exhibits a threshold effect, and if so what that threshold is. There is also insufficient information to determine whether the dose-response relationship is linear, supra-linear, or sub-linear. Given these limitations, we have assumed a no-threshold linear dose-response relationship. If future information becomes available to improve upon this assumption, it would be possible to update our analysis to incorporate an alternative dose-response relationship.

---

[17] Because of lack of available information, we have not investigated the potential for synergistic effects between DPM, other PM, and other air pollutants.

3.0 Results

Based on a review of the Gaussian plume air dispersion results, we find that:

- The direct mortality risks due to PM2.5 emissions are the most significant public health impact of BUG emissions.

- Annual average concentrations lead to unacceptably high chronic cancer risks. For all of the scenarios we evaluated there are chronic cancer risks above one per million. A majority of the runs yield chronic cancer risks at or above 10 per million.

- The Risk Zone, which is defined by the furthest distance from the source with a cancer risk of one per million or greater, extends up to several hundreds of meters from the BUG. If BUGs operate for a large number of hours per year, the risk zone extends up to a kilometer or more from the BUG.

- Diesel engine exhaust is included on the State of California's list of chemicals that are known to cause cancer. Under the state's Proposition 65 law, businesses are required to warn the public before exposing them to carcinogens at risks exceeding 10 per million. Emissions from a BUG may trigger this requirement.

- For accumulated exposures over the long term, the direct mortality risks associated with PM2.5 are estimated to be 13 times greater than the chronic cancer risk associated with DPM. This means that the total health risk within the chronic cancer risk zone exceeds 10 per million, a level that is often considered cause for regulatory intervention for sources of toxic air contaminant

- In some circumstances, the 24-hour concentration of PM10 from a BUG is predicted to exceed the State of California's 24-hour PM10 standard of 50 $\mu g/m^3$. As we discuss below, the air dispersion modeling by ARS does not account for background levels of PM10. If background PM10 is also considered, it is highly likely that the incremental pollution from BUGs will lead to exceedances of the ambient concentration standard.

- The 1-hour average does not exceed the acrolein REL. Based on this evidence, we therefore tentatively conclude that acute risks from specific toxic air contaminants do not exceed acceptable levels. This conclusion is tentative, because data are incomplete regarding emissions and toxicity values for toxic air contaminants emitted from BUGs.

3.1 Air Dispersion Model Results

In this section, we discuss the results of air dispersion modeling for the five cities considered in this study (Fresno, Los Angeles, Sacramento, San Francisco, and San Diego). Detailed results are presented in Appendix 2, including Tables 2-1 through 2-7.

Table 2-1 presents model output in terms of the ground-level concentration increase of DPM as a function of distance from the BUG. Other tables present interpretations of the modeled output, as follows:

- The **maximum 1-hour average**, which is used to evaluate acute risks for acrolein and total PAH (see Table 2-2).
- The **maximum 24-hour average**, which is used to evaluate the likelihood of exceeding the State of California's 24-hour PM10 standard of 50 $\mu g/m^3$ (Table 2-3).
- The **annual average**, which is used to evaluate the chronic cancer risk from exposure to diesel particulate matter (Table 2-4). These results were also used to estimate the direct mortality risk of PM2.5 exposure. Other chronic cancer and chronic non-cancer risks were not evaluated because they are less stringent than the chronic cancer risk from DPM.

Because the meteorology at a specific location tends to follow consistent patterns, annual average concentrations tend to be higher in the prevailing downwind direction. Consequently, the annual average concentrations are presented for both the prevailing upwind and downwind directions.

By contrast, the 1-hour and 24-hour concentrations from modeling several years of meteorological data are relatively symmetrical with respect to direction. The upwind and downwind concentrations are similar because the meteorology that leads to the maximum 1-hour and 24-hour concentrations at a given distance is likely to occur for all wind directions. This result is borne out by the isopleths of maximum 1-hour and 24-hour concentration, which occur in a roughly circular shape around the BUG. Because the upwind and downwind values are so similar for the maximum 1-hour and 24-hour concentrations, we have presented single values to represent the results in any direction.

The annual averages represent the average concentration over roughly five years of data. For each scenario, the location with the highest average concentration is noted, and that concentration is recorded (see Table I.). This metric — the maximum ground-level concentration for annual average conditions— represents the long-term exposure concentration for a hypothetical Maximally Exposed Individual (MEI), who spends all of his or her time at the location of maximum average impact.

Table I. Maximum Annual Average Concentration of Diesel Particulate Matter ($\mu g/m^{-3}$) from a Single Back-Up Generator

			Model Specifications per Year of Meteorological Data				Average Concentration Over Modeling Period	Average Concentration when the BUG is On	Compare with "All" Scenario	Annual Average Concentration, Based on Hours Running Per Year			
			Number of Days	Number of Hours	Number of Hours with BUG On	Number of Hours with BUG Off				50	100	500	1000
Fresno	500 hp	all	365	8760	8760	0	7.93	7.93	-	0.05	0.09	0.45	0.91
Fresno	500 hp	summer	122	2928	732	2196	5.4	21.60	2.7	0.12	0.25	1.23	-
Fresno	500 hp	business	365	8760	4380	4380	5.57	11.14	1.4	0.06	0.13	0.64	1.27
Fresno	1500 hp	all	365	8760	8760	0	2.07	2.07	-	0.01	0.02	0.12	0.24
Fresno	1500 hp	summer	122	2928	732	2196	1.41	5.64	2.7	0.03	0.06	0.32	-
Fresno	1500 hp	business	365	8760	4380	4380	1.4	2.80	1.4	0.02	0.03	0.16	0.32
San Diego	500 hp	all	365	8760	8760	0	7.82	7.82	-	0.04	0.09	0.45	0.89
San Diego	500 hp	summer	122	2928	732	2196	5.14	20.56	2.6	0.12	0.23	1.17	-
San Diego	500 hp	business	365	8760	4380	4380	6.94	13.88	1.8	0.08	0.16	0.79	1.58
San Diego	1500 hp	all	365	8760	8760	0	2.1	2.10	-	0.01	0.02	0.12	0.24
San Diego	1500 hp	summer	122	2928	732	2196	1.41	5.64	2.7	0.03	0.06	0.32	-
San Diego	1500 hp	business	365	8760	4380	4380	1.88	3.76	1.8	0.02	0.04	0.21	0.43
San Francisco	500 hp	all	365	8760	8760	0	10.3	10.30	-	0.06	0.12	0.59	1.18
San Francisco	500 hp	summer	122	2928	732	2196	6.66	26.64	2.6	0.15	0.30	1.52	-
San Francisco	500 hp	business	365	8760	4380	4380	5.92	11.84	1.1	0.07	0.14	0.68	1.35
San Francisco	1500 hp	all	365	8760	8760	0	2.99	2.99	-	0.02	0.03	0.17	0.34
San Francisco	1500 hp	summer	122	2928	732	2196	2.05	8.20	2.7	0.05	0.09	0.47	-
San Francisco	1500 hp	business	365	8760	4380	4380	1.87	3.74	1.3	0.02	0.04	0.21	0.43
Los Angeles	500 hp	all	365	8760	8760	0	12.73	12.73	-	0.07	0.15	0.73	1.45
Los Angeles	500 hp	summer	122	2928	732	2196	10.02	40.08	3.1	0.23	0.46	2.29	-
Los Angeles	500 hp	business	365	8760	4380	4380	11.63	23.26	1.8	0.13	0.27	1.33	2.66
Los Angeles	1500 hp	all	365	8760	8760	0	3.4	3.40	-	0.02	0.04	0.19	0.39
Los Angeles	1500 hp	summer	122	2928	732	2196	2.82	11.28	3.3	0.06	0.13	0.64	-
Los Angeles	1500 hp	business	365	8760	4380	4380	3.12	6.24	1.8	0.04	0.07	0.36	0.71
Sacramento	500 hp	all	365	8760	8760	0	6.44	6.44	-	0.04	0.07	0.37	0.74
Sacramento	500 hp	summer	122	2928	732	2196	5.27	21.08	3.3	0.12	0.24	1.20	-
Sacramento	500 hp	business	365	8760	4380	4380	5.23	10.46	1.6	0.06	0.12	0.60	1.19
Sacramento	1500 hp	all	365	8760	8760	0	1.74	1.74	-	0.01	0.02	0.10	0.20
Sacramento	1500 hp	summer	122	2928	732	2196	1.44	5.76	3.3	0.03	0.07	0.33	-
Sacramento	1500 hp	business	365	8760	4380	4380	1.41	2.82	1.6	0.02	0.03	0.16	0.32

Each city was run using all available years of meteorological data.

The column labeled 'Comparison with "All" Scenario' is a ratio of the concentration for the summer or business scenario with the analogous All Scenario. This comparison indicates how the summer and business subsections of the meteorology differ from the entire dataset.

Values in this chart are the average annual average over five years of meteorological data, taken at the worst-case location. This is often referred to as the concentration at the location of the MEI (Maximally Exposed Individual).

The values in Table I. are important for two reasons. First, regulatory decisions are often made based on the risk at the MEI location, and this would be calculated from the concentrations in Table I. Second, Table I. shows that the average meteorological conditions are different under the three scenarios. Maximum ground-level concentrations during the average **summer** scenario hour are approximately three times higher than in the average **all** scenario hour. This means that, ceteris paribus, if BUGs operate only during summer afternoons, the impact of their emissions to the MEI will be three times greater than if BUGs operate with equal probability during any hour of the year.

There are two reasons why the summer hours have higher maximum annual averages. First, in some locations, the wind direction is more consistent during summer afternoons than during the whole year. This means that emissions from different hours are more likely to impact the same location under the **summer** scenario than under the **all** scenario. Second, vertical dispersion is relatively strong during summer afternoons because the sunlight warms the ground and causes unstable atmospheric conditions. Far away from the BUG this instability causes greater mixing and therefore lower concentrations; however, in the immediate vicinity of the BUG, increased dispersion causes the plume to mix down to the ground rapidly, leading to high local concentrations. Both of these factors — the increased dispersion and the more consistent wind direction — cause the MEI to have a higher exposure concentration during the **summer** scenario than in the **all** scenario.

3.2 Chronic Cancer Risk Zones

ARS presents the annual average concentrations, and the associated cancer risk, in terms of isopleths around the BUG for each run scenario. In order to understand more easily the air dispersion results, we have summarized the ARS results in terms of risk zones.

The "risk zone" is defined as the furthest distance away from the BUG where the risk exceeds a specified level (e.g., 1 per million). This information answers the question, "how close is too close?" for environmental health concerns. One reason to present air dispersion model results in terms of risk zones is to investigate the issue of BUG clusters, wherein BUGs are locations close enough to each other that people are exposed to emissions from more than one BUG. Clustering could lead to the total impact from BUGs on a person or community being higher than is presented in this report.

Table 2-6 shows the risk zone in terms of threshold chronic cancer risks, based on the predicted annual average concentrations. Higher threshold risk values yield smaller risk zones, while lower threshold risk values yield larger risk zones. In analyzing urban air toxics "Hot Spots," OEHHA uses a threshold risk of one per million to define risk zones[18]. We present the size of the risk zone in the upwind and downwind directions, for threshold risk levels of 0.5, 1, 5, 10, 50, and 100 per million.

The size of the risk zone around a BUG depends on the city, the number of run hours, the scenario under which the BUG operates, and the threshold level of risk. In Table II, we have

---

[18] Chapter 2: Air Dispersion Modeling. Technical Support Document for Exposure and Stochastic Analysis, September 2000. Available on-line at http://www.oehha.ca.gov/air/hot_spots/pdf/chap2.pdf.

summarized Table 2-6 by showing the risk zone for a 1 per million risk, based on the chronic cancer risk of DPM.

Table II. Chronic Cancer Risk Zone

Distance (in meters) within which the chronic cancer risk exceeds one per million.

	Run hours	Upwind		Downwind	
		low	high	low	high
Sacramento	50	0	0	170	290
	100	0	60	290	410
	500	0	920	280	950
	1000	290	350	1,220	1,410
Los Angeles	50	0	60	120	190
	100	0	150	220	310
	500	0	610	490	840
	1000	420	960	950	1,270
San Diego	50	0	0	130	320
	100	0	110	200	500
	500	0	450	890	1,370
	1000	330	700	1,740	2,180
Fresno	50	0	0	170	430
	100	0	80	260	670
	500	110	560	1,070	1,860
	1000	360	890	1,760	2,950
San Francisco	50	0	80	170	250
	100	0	150	280	360
	500	0	450	650	930
	1000	560	690	960	1,410

The difference between the high and low values in each row of Table II is due to differences between the two different BUG sizes and the three different scenarios for when run hours occur (**all**, **summer**, and **business**). The minimum value in the downwind direction is always greater than zero, indicating that all of the model results show a risk greater than 1 per million in the downwind direction.

Given the typical placement of BUGs near hospitals, schools, office buildings, and other buildings where people live and work, the population within the risk zone may be substantial. Because of the close proximity between the source and the receptor, the exact placement of a BUG in relation to the surrounding buildings will be important.

Buildings can cause a variety of issues that are not accounted for by our model runs, and which could be especially significant for a specific BUG, including the following:

- The **street canyon effect**[19], wherein emissions are trapped between two rows of buildings, as in a street in the business district of an urban downtown. This would lead to significantly higher concentrations than would be predicted by ISC because wind speeds and dispersion would be much lower within the street canyon.
- **Building downwash**, which occurs in the "wake" of a building, where ambient air flowing over the building descends from the top of the building to the ground level. This can counteract plume rise and quickly bring elevated emissions down to the ground level. While both building downwash and the street canyon effect can increase exposure concentrations compared to ISC predictions, the latter involves localized low-dispersion conditions while the former involves a specific type of localized high-dispersion conditions.
- Emissions entering a **building air intake** manifold. This could lead to significantly higher exposure concentrations for occupants of a nearby building than are predicted by ISC. If an air intake manifold is located near the plume from the BUG stack, a significant portion of the emissions can enter the building. Emissions entering the indoor environment are transported and dispersed away from a source much more slowly than in outdoor air.
- **Exposures above ground level**, which can occur for occupants in a building that intercepts the emissions plume. ISC calculates the ground-level concentration, and individuals above the ground level may be exposed to elevated concentrations.

3.3 California's Proposition 65

California's Proposition 65 ("Prop 65") requires the Governor to publish a list[20] of chemicals that are known to the State of California to cause cancer, birth defects or other reproductive harm[21]. Prop 65 also requires that businesses provide a "clear and reasonable" warning before knowingly exposing people to carcinogenic chemicals.

Diesel engine exhaust was added to this list on October 1, 1990. Based on the modeling results from ARS, we find that diesel engine exhaust emissions from a BUG may exceed Prop 65's "significant risk" level[22] of 1 per 100,000. According to the Office of Environmental Health Hazards Assessment (OEHHA)[23],

> "Under the law, a warning must be given unless a business demonstrates that the exposure it causes poses no significant risk. For a chemical that is listed as a carcinogen, the "no significant risk" level is defined as the level which is calculated to result in not more than one excess case of cancer in 100,000 individuals exposed over a 70-year lifetime. In other words, if you are exposed to the chemical in question at this level every day for 70 years, theoretically it will increase your chances of getting cancer by no more than 1 case in 100,000 individuals so exposed"[24].

---

[19] There have been a number of investigations on this effect, including numerical models, field studies, and wind tunnel experiments. See, for example, Chan *et al*. Validation of a Two-dimensional Pollutant Dispersion Model in an Isolated Street Canyon. Atmospheric Environment. 2002; 36:861-872.

[20] http://www.oehha.org/prop65/prop65_list/12502LSTA.pdf

[21] Further information on this regulation is available from http://www.oehha.org/prop65.html

[22] The risk level of 1 per 100,000 is the same as 10 per 1,000,000

[23] http://www.oehha.org/prop65/background/p65plain.html

[24] California Health and Safety Code Section 25249.6 is the citation for this Prop 65 requirement

Businesses employing fewer than 10 persons and all government agencies are exempt from this law.

3.4 Direct Mortality Risk

As is presented section 2.3.3 and Appendix 4, the risk of acute and chronic (1-year) mortality due to PM2.5 is roughly 13 times greater than the chronic cancer risk due to DPM. Therefore, the one-per-million chronic cancer risk zone is equivalent to a 13-per-million mortality risk zone.

Assuming 11,000 BUGs operating throughout California, an average of 100 hours of operation per unit per year, and a state-wide average intake fraction (section 5) of 15 per million[25], we estimate that BUG emissions will cause approximately 72 deaths per year due to PM2.5 emissions. The estimated number of deaths in each year due to PM2.5 from diesel engines will depend on the meteorology and number of run hours for that year. The risk to a specific exposed population will depend on the number of BUGs to which the people are exposed, and the distance between the BUGs and people. Mortality risk from BUGs will be greater for people who live and work near BUGs. We expect young people, the elderly, and the infirm to be the most susceptible to acute mortality due to PM2.5. The toxicity values used here for mortality risk represent the risk to the public as a whole, rather than to any specific sub-population.

3.5 Ambient PM10 Concentrations

Modeled concentrations presented in this report represent incremental concentration increases attributable to a generic BUG. In reality, BUG emissions will occur in already polluted urban areas. The total emission of DPM from all BUGs is small relative to existing emissions from other diesel engines. Thus, we do not expect BUGs to lead to serious increases in basin-wide concentrations of ambient DPM. However, when these emissions are added to existing ambient concentrations, it becomes probable in some circumstances that the PM10 concentration in the vicinity of the BUG would exceed the State 24-hour PM10 standard of 50 ug/m^3. Information about ambient PM10 concentrations is presented below.

The 2001 California Almanac of Emissions and Air Quality[26] provides information on ambient concentrations of PM and other criteria pollutants and urban air toxics. In Chapter 3 of the almanac, it is observed that, “currently, over 99 percent of Californians breathe air that violates the State PM10 standards during at least part of the year. As a result, particulate matter is commanding greater attention, and much effort will be needed to attain the standards for this pollutant.” Clearly, the 24-hour standard for PM10 is an important issue, and the contributions of emissions from BUGs to ambient concentrations that may cause the standard to be exceeded, even locally, should be scrutinized.

The applicable 24-hour average PM concentration standards are given in Table III.

---

[25] An intake fraction of 15 per million means that 15 grams of pollutant are inhaled by the population, per million gram (i.e., per tonne) of pollutant emitted.

[26] This document is available for download on the Internet at http://www.arb.ca.gov/aqd/almanac01/almanac01.htm.

Table III. 24-Hour Average Particulate Matter Concentration Standards

Regulatory Agency	Pollutant	Concentration Standard (μg/m^3)
CalEPA	PM2.5	(No standard)[27]
CalEPA	PM10	50
USEPA	PM2.5	65 (Proposed standard)
USEPA	PM10	150

While there is currently no enforceable PM2.5 standard from CalEPA or USEPA, the latter agency has a proposed standard, which is expected to become part of the National Ambient Air Quality Standards (NAAQS). CalEPA may also provide guidance on this issue in the future.

Appendix A of the almanac lists, for each air basin and year:

- The number of days violating the state 24-hour PM10 standard;
- The number of days violating the federal 24-hour PM10 standard;
- The maximum 24-hour concentration; and,
- The highest annual average concentration at the various monitoring stations.

As Table IV demonstrates, the State of California's 24-hour PM10 standard is violated frequently.

Table IV. Number of Violations in 1999 of the State of California's 24-Hour PM10 Standard

Air Basin	Number of Violation Days
Sacramento Valley	66
San Diego	126
San Francisco	36
San Joaquin Valley	174
South Coast	258

---

[27] As of August 2002, the California Air Resources Board is evaluating the appropriateness of establishing a 24-hour PM2.5 ambient air quality standard. See, for example, http://arbis.arb.ca.gov/research/aaqs/std-rs/2_5defer.htm and http://arbis.arb.ca.gov/research/aaqs/std-rs/pm-final/pm-final.htm.

4.0 Low Wind Speed (Calm) Conditions

4.1 Introduction

An important limitation of ISC is that it cannot estimate concentrations for hours when the wind speed registers “zero.” At first, this might not seem to be a significant limitation, because it is highly unlikely that a body of air could actually exhibit a wind speed of zero. However, 5 – 20% of the hours in the meteorological data have a zero reported wind speed because the instrument that measures the wind speed requires a certain minimum level to record any positive value. When the wind speed is below the detection limit, a value of zero is recorded for the wind speed.

For the meteorological data that we have used, wind speeds are recorded as a discrete (i.e., whole numbers only) variable with a minimum value of 3 knots[28]. When the meteorological data files are pre-processed for use in ISC, the wind speed values in knots are converted to meters per second. Thus the wind speeds used by ISC are discetized into values of 0.00, 1.54, 2.06, 2.58, etc. meters per second, which correspond to 0, 3, 4, 5, etc. knots.[29]

The reason ISC cannot estimate concentrations when the wind speed is zero is this: in the Gaussian plume dispersion equations used by ISC, the concentration is proportional to the reciprocal of the wind speed. Thus, the concentrations are predicted to be larger when the wind speeds are smaller. When the wind speed is zero, the model is unable to compute a predicted concentration because it is not possible to divide any number by zero (i.e., one divided by zero is infinity). Near-zero wind speeds are also not handled well by ISC because the reciprocal of a very small number is a large number. Thus, ISC is not a useful tool for calm meteorological conditions. However, because of weak transport and dispersion during low wind-speed events, ground level concentrations caused by near ground-level releases can be high in the vicinity of an emission source during calm conditions.

In their guidance on treatment of calms[30], the EPA recommends that “hourly concentrations calculated with Gaussian models using calms should not be considered valid; the wind and concentration estimates for these hours should be disregarded and considered to be missing.” Thus, if there are four hours of calms in a day, ISC will compute the average concentration during the 20 non-calm hours, and report this as the 24-hour average concentration. Similarly, if there are 1000 hours of calms in a year, ISC will compute the average concentration during the 7760 non-calm hours, and report this as the annual average concentration.

---

[28] Not all meteorological data files are identical with respect to classification of calms. Some files have a minimum value of 3 knots, while others have a threshold of 2 knots. At least one of the files we looked at reported only a few hours of 2-knot winds. This small number of hours, taken from five years of data, suggests that for most hours the threshold was 3 knots, but that a small number of hours had a threshold of 2 knots.

[29] Meteorological data with a lower threshold wind speed (of 2 knots/hour) may reduce the incidence of calm hours and improve upon the reliability of the modeling data.

[30] EPA’s discussion and recommendations regarding calm conditions are taken from 40 CFR Ch 1 (7-1-01 Edition), Part 51, Appendix W, Section 9.4.3: Treatment of Calms.

It is probable that this approach biases the ISC model results such that they under-predict true peak and average concentrations for certain sources such as BUGs. It is likely that calm conditions produce higher concentrations near such sources than non-calm conditions. EPA guidance states that, “stagnant conditions, including extended periods of calms, often produce high concentrations over wide areas for relatively long averaging periods. The standard short term Gaussian models are often not applicable to such situations.” ISC biases the concentrations low by systematically ignoring the hours when we expect the highest concentrations to occur. This is a significant concern.

If this issue had an easy solution, it would already have been incorporated into the ISC model. As the EPA notes, “our knowledge of plume behavior and wind patterns during these [calm] conditions does not, at present, permit the development of a better technique.” However, ignoring the issue altogether means that ISC fails to predict a potentially significant portion of the risk due to back-up generators.

Rather than ignoring calms, an alternative procedure[31] can be used to estimate concentrations during calms. While we are unable to provide a robust estimate of the concentrations and risks that occur during calm hours, we are able to show that this is a potentially significant issue that should not be neglected.

The remainder of this section on low wind speed conditions is divided into three parts. First we discuss how calm conditions are significant to the risk assessment results. Then, we analyze the meteorological data for the prevalence of calms. Finally, we present two methods for estimating the concentrations that occur during calm wind conditions. The supporting calculations for these analyses are presented in Appendix 3.

4.2 Significance to Risk Assessment Results

ISC’s inability to process calm hours influences our ability to accurately assess the risk from BUG emissions, in terms of the acute health hazard, the likelihood of generating concentrations that exceed the CalEPA and USEPA 24-hour PM10 standards, and the chronic cancer risk.

- **Acute health hazard.**

  As the Methods section states, the determination of the level of risk for acute health hazards is based on RELs, which are determined for 1 – 14 day exposure scenarios. The concentration of acrolein may exceed the REL if there are several hours of calms per day, and if there are several days in a row with a significant fraction of calms. Our upper-bound estimate of concentrations during calm hours, presented below and in Appendix 3, is 3 – 4 times higher than the acute REL for acrolein at a distance of 100 meters from the BUG. If the ambient concentration during calm conditions is three times the REL, and if emissions and calms occur concurrently for 8 hours per day for 1 –

---

[31] One alternative procedure is to pre-process the meteorological data, such that all calm hours are replaced with a wind speed equal to an arbitrary value, such as 0.5 or 1 m/s, and with a wind direction that is either randomly chosen or is set equal to the value of the previous hour. However, EPA guidance says not to use this procedure. Furthermore, the procedure does not address the question of whether ISC is an appropriate model for low wind-speed conditions.

14 days, then the time-weighted concentration due to BUG emissions may reach the REL.

- **CalEPA and USEPA 24-hour PM10 standard.**

  During days when there are several hours of calms, BUG emissions may lead to exceedances of the State 24-hour PM10 standard of 50 μg/m^3 in the immediate vicinity. For example, if the concentration during a calm hour is 150 μg/m^3, and a BUG runs during 8 calm hours, then 24-hour PM10 concentration will be at the 50 μg/m^3 limit even before accounting for background concentrations or other local sources.

  That these emissions occur in already-polluted areas increases the chances that incremental emissions from a BUG will cause a local exceedance of the 24-hour PM10 standard. For example, if the ambient time-averaged concentration is 40 μg /m^3, and BUG emissions during calm conditions lead to an incremental concentration increase of 150 μg/m^3, then only 2 calm hours of BUG emissions per day would cause a combined 24-hour average concentration of 52.5 μg/m^3.

- **Mortality and Chronic cancer risk**

  Only a small number of hours of BUG operation during calm conditions would suffice to cause chronic cancer risks in excess of 10 per million, owing to DPM emissions. For example, if calm conditions lead to local concentrations of 150 μg/m^3, then an annual total of 20 hours of BUG operation during calms could lead to an annual average concentration of 0.34 μg/m^3, which, if repeated chronically, would correspond to a chronic cancer risk greater than 100 per million. Similarly, a small number of hours of calms would significantly increase the mortality risk if these calm hours lead to high exposure concentrations.

4.3 Prevalence of Calms in the Meteorological Data

To indicate the significance of calms as part of the overall meteorological pattern, we present data on the fraction of hours per year during which calm conditions occur, and the average number of calm hours that occur each day. This information, based on wind rose plots from ARS, is given in Table V.

Table V. Percentage of Hours in the Meteorological Data with Calms

City	Percent of hours that have a wind speed of zero	Average number of calm hours each day
Fresno	14.4%	3.5
Los Angeles	7.3%	1.8
Sacramento	19.0%	4.6
San Diego	5.9%	1.4
San Francisco	5.0%	1.2

For example, Fresno has 3.5 hours of calms per day on average. The number of calms per day varies significantly, as is shown in Figure 3-1 (see Appendix 3). This figure presents the number of days with equal to or more than a certain number of hours per day. For example, the line in Figure 3-1 for Sacramento crosses the 25% mark at about 8 hours per day, meaning that a quarter of the days in the year have 8 or more hours of calms.

Days with a high number of calms are not evenly distributed throughout the year. This seasonal variability is shown in Figure 3-2 of Appendix 3, where we present the average number of calms per day during each month for each of the five cities. Figure 3-2 demonstrates that the frequency of occurrence of calms can be substantial. For example, in Sacramento, five months of the year have five or more calm hours per day on average, and November shows an average of more than ten hours per day of calms. Any emissions that occur during these ten hours per day would be treated as “missing” by ISC.

The calm hours are not evenly distributed throughout the day. Rather, calms are more likely to occur at night and in the early morning hours. Coincidence of BUG operation and calms may be infrequent, and if so, this would reduce the level of concern about their exclusion from the ISC analysis. Wind rose plots in the ARS report separately show calms during run and during non-run hours, for the **summer** and **business** scenarios. For all five cities, calms are considerably more likely during the non-run (nighttime) hours than during the run (daytime) hours. For example, in Sacramento the calms occurred during only 3% of the run hours but during 20% of the non-run hours for the **summer** scenario. For the Sacramento **business** scenario, calms occurred during 13% of the run hours and 25% of the non-run hours. Note that the overall percent of calms, listed in Table V (above) as 19%, can be thought of as a time-weighted average of the run and non-run hours.

ARS concludes that the worst concentration-to-emissions ratio occurs during summer afternoons, when BUGs are more likely to operate due to power curtailments. However, this analysis does not include the contribution of calm hours, which can have higher concentrations than summer afternoons, but which are not modeled by ISC. Calms occur frequently in the early morning hours, when businesses are likely to run the BUG for testing purposes. Pollutant concentrations in the vicinity of the BUGs during these hours could be high.

4.4 Estimated Concentrations during Calm Conditions

The fact that ISC does not model calm conditions means that it is likely to underestimate the true impact of BUGs because, as the EPA guidance document points out, we expect concentrations to be higher under low wind conditions. This is emphasized in Figure 3-3 (Appendix 3), which shows that a *single* calm hour might have higher concentrations than the *worst* 1-hour ISC modeled result from five years of meteorological data. Note that in the ARS report, the worst hours occur during summer afternoons while calms occur during nighttime and early morning hours. The high concentrations predicted by the ISC model during summer afternoons are due to high wind speeds causing a reduction in plume rise. This allows the plume to reach the ground relatively quickly, before mixing disperses the pollutants. In contrast, calm conditions may lead to high concentrations because the limited dispersion leads to less mixing and therefore less dilution.

We estimate DPM concentrations during calm conditions to be between 30 and 1000 $\mu g/m^3$ at 100 meters, and between 2 and 400 $\mu g/m^3$ at 400 meters downwind of a BUG. Below, we summarize the two methods we used to estimate near-source concentrations during calm hours. Further details about these two methods are presented in Appendix 3.

The first method uses the results from field experiments by Sagendorf and Dickson (1974)[32]. These authors released a tracer gas (sulfur hexafluoride, SF_6), and then measured the concentrations at rings of receptors located 100, 200, and 400 meters away. They present their results in terms of the wind speed, measured concentration of SF_6, and emission rate. We can modify their results to estimate DPM concentration impacts by BUGs by using a low wind speed that would be recorded as calm (0.5 m/s) and an emission rate for DPM of 1.1 pounds per hour (taken from AP-42 for a 500-hp BUG).

The second method uses an expanding box model, which tracks the volume of the plume. As the plume spreads, the same amount of contaminant mass occupies a larger volume of space, and this is what causes the concentration to decrease at increasing distances away from the source. The box is modeled as having a uniform concentration. The vertical and horizontal dimensions of the box are taken from the plume width (σ_z and σ_y) based on extreme Pasquill stability classes A (unstable) and F (stable). During calm conditions, the time-averaged plume is expected to be wider than during other conditions, owing to the increased meandering of the plume. We increase the horizontal dimension of our box by a factor of 6 to account for this effect[33].

One of the limitations of our estimation methods is that they do not account for plume rise, which is likely to be on the order of a few tens of meters. This limitation is acceptable because our purpose is to demonstrate that near-source concentrations during calm conditions may be significant. Our purpose is not to provide an actual estimate of risk. The lack of plume rise in our calculations means that our results may overestimate near-source concentrations during calms.

---

[32] Sagendorf, JF and Dickson, CR. Diffusion under low wind-speed, inversion conditions. 1974. NOAA Technical Memo. ERL ARL-52.

[33] Wilson RC, Start GE, Dickson CR, and Ricks NR. Diffusion under low wind speed conditions near Oak Ridge, Tennessee. 1976. NOAA Technical Memo. ERL ARL-61. Cited in: Brusasca G, Tinarelli, G, and Anfossi G. Particle Model Simulations of Diffusion in Low Wind Speed Stable Conditions. Atmospheric Environment 26A(4), 707-723. 1992.

5.0 Intake Fraction

The source-by-source approach used in a conventional health risk assessment (HRA) is designed to accommodate a small number of large sources, where the local impacts are large. While it is possible to complete a conventional HRA for a situation involving many individuals and many sources, this becomes increasingly difficult as the number of sources and individuals increases. For a distributed source such as diesel backup generators, with approximately 11,000 units in California whose emissions may reach the breathing zone of many millions of people, it is important to consider the cumulative impact to the entire population. Because an evaluation of the health risks associated with BUGs represents a different context from situations typically evaluated in a health risk assessment, we have incorporated an intake fraction analysis as an alternative approach for quantifying these risks.

The intake fraction approach summarizes the impact of BUG emissions on the total population-wide intake of DPM and the incremental risk owing to this exposure. Intake fraction is defined as the fraction of emissions from a source that is breathed (taken in) by an exposed population. It is calculated as the ratio of the total intake, summed over all people, divided by the total emissions. Intake fraction (iF) for inhalation of atmospheric emissions depends on three main factors:

- The **proximity** between the source and those exposed;
- The size of the **population** that is exposed to a source (and their breathing rate); and
- The **persistence** of the pollutant in the environment.

In considering a specific exposed population (e.g., the residents of the Sacramento air basin), various chemicals will have a similar value for the intake fraction if they are similar in their persistence and in the proximity of sources to receptors. This will be the case for all pollutants we consider in this analysis because we are restricting our investigation to

- chemicals that are non-reactive on the time scale of air flow through an air basin, and
- emission sources that are well-distributed throughout the area where people live.

Thus, we would expect that all of the pollutants we consider in this analysis to have similar values for the intake fraction. Because of these restrictions, we can apply the intake fraction values derived for one pollutant to other species.

Three pieces of information are needed to calculate the population-wide excess health-effect burden using an intake fraction approach: the total emissions from the source; the intake fraction for a distributed source; and the intake-based toxicity.

Using ambient concentration data and emissions inventories, we have calculated an intake fraction of 5 – 22 per million for primary, non-reactive pollutants from well-distributed sources in major California air basins (South Coast, San Francisco Bay Area, San Diego, San Joaquin Valley, and Sacramento Valley). This value of the intake fraction implies that between 5 and 22 grams of pollutant are inhaled for every million grams (i.e., for every tonne) emitted. For DPM specifically, we find an average intake fraction of 15 per million. In Appendix 4-5 we provide the concentration and emissions data from which this value is calculated. Note that intake fraction values of 5 – 22 per million for DPM are consistent with the median values of 7 – 31 per million that have previously been estimated from similar data for hazardous air pollutants from well-distributed sources in major California air basins[34] (South Coast, San Francisco Bay Area, San Diego, San Joaquin Valley, and Sacramento Valley).

In Appendices 4-1 and 4-2 we estimate the total population-wide cancer and mortality impact from BUGs using an intake fraction approach. We start by converting the units used to express the toxicity of DPM. CalEPA uses a concentration-based toxicity of 0.000300 per $\mu g/m^3$ [35], meaning that if a person were exposed to 1 $\mu g/m^3$ of DPM for their entire 70-year lifetime, we would predict an excess cancer risk of 0.000300 (i.e., 300 per million). In Appendix 4-1 we convert this to an intake-based toxicity of 978 per million per gram of intake, meaning that if a person inhales 1 gram of DPM during their entire 70-year lifetime, we would predict an excess cancer risk of 978 per million. Similarly, a population intake of 1.0 kg will be expected to lead to approximately one excess cancer case in the exposed population. As shown in Appendix 4-2, a population intake of 0.077 kg per year is estimated to cause one excess death per year owing to the direct mortality effect of PM.

The final step in this calculation is to determine the total emissions by all BUGs. For this calculation, which is presented in Appendix 4-3, we assume that there are a total of 11,344 BUGs in California[36] operating an average of 100 hours per year.[37] Consequently, the total run time for all BUGs taken in aggregate is 1,134,400 hours. Using emission factors[38] of 0.0022 pounds (1 gram) of PM per horsepower-hour for smaller BUGs (ranging from 100 to 600 hp) and 0.0007 lb/hp-hr for larger BUGs (601 to 2100 hp), these roughly 1.1 million hours of operation cause a total of 379 million grams (i.e., 379 tonnes) of DPM emissions[39].

The above data points are combined as follows:

- **Emissions**: 379 tonnes of DPM emitted each year;
- **Intake fraction**: 0.015 kg are inhaled per tonne emitted;
- **Toxicity**: one cancer case per 1.0 kg of DPM inhaled, and one death per 0.077 kg of PM inhaled.
- **Total Excess cancer cases and PM mortality**: The above numbers are combined to yield a prediction of approximately five excess cancer cases per year and approximately 72 excess deaths per year due to BUG PM emissions.

In the units "cancer cases per year" and "deaths per year," the "per year" refers to per year of BUG operation. Thus, based on the above assumptions we expect five ultimate cancer cases for each year of BUG operation. These cancer cases will generally not occur in the same year as the emissions; indeed, they are likely to occur many years later. If BUGs operate for 70

---

[34] WW Nazaroff et al., Environmental health implications of electricity generation choices: Pollutants of concern and exposure issues, 2nd Haagen-Smit Symposium, Lake Arrowhead, CA, 9-12 April 2002, California Air Resources Board, Sacramento, CA.

[35] 300 per million per $\mu g/m^3$ is the same as 0.000300 per $\mu g/m^3$.

[36] Taken from the CARB Diesel Risk Reduction Plan Appendix II: Stationary and Portable Diesel-Fueled Engines. Available from http://www.arb.ca.gov/diesel/documents/rrpapp.htm.

[37] A survey of permitting regulations for BUGs indicates that most California air quality management districts allow 100-250 hours of operation per year.

[38] Taken from EPA's Compilation of Air Pollutant Emission Factors AP-42. Available from http://www.epa.gov/ttn/chief/ap42/index.html.

[39] This analysis uses information from the California Energy Commission's BUGs database about the number of BUGs in various ranges of generating capacity. The results, presented in Appendix 4-3, indicate that the average BUG size, weighted by the number of BUGs in each category, is approximately 590 hp.

years, we would expect 380 cumulative excess cancer cases to occur in the exposed population during and after the 70-year period[40].

The risk units that we are using in this section are different from the units that are typically used. A more conventional cancer risk assessment would evaluate emissions in a given year in terms of the cancer risk *if the emissions were to continue at the same level for 70 years*. Here, we are evaluating emissions in a given year in terms of the cancer risk attributable *to that year's emissions alone*.

The cancer and mortality risks will not be spread evenly throughout the population, but rather will be concentrated in the populations that are most exposed to BUG emissions. As is to be expected, areas with the highest portion of BUG emissions will be at the highest risk. The above calculations are linear, so a 50% increase in the emissions will lead to a 50% increase in the excess cancer rates and in the excess mortality rates. Table VI (below) shows the increase in chronic cancer cases and PM mortality as annual run hours increase.

Table VI. Estimated Annual Excess Cancer and PM Mortality by Run Hours, per Year of BUG Operation

Average Annual Run Hours per BUG	**Chronic Cancer Cases (per year)**	**PM Mortality (per year)**
50 hours	3	36
100 hours	5	72
250 hours	14	180
500 hours	27	360
1000 hours	54	720

If even a small number of BUGs are used regularly as distributed electricity generators (instead of purely for emergency standby operation), overall run time and emissions could rise significantly. For an illustrative example of this point, assume that BUGs used for distributed generation (DG) are operated for 1000 hours annually. Then, if just 10 percent of the entire BUG population is operated as DG, cancer cases and PM mortality will almost double. Table VII illustrates the increase in cancer cases and PM mortality with increased BUG use for DG under this assumption.

---

[40] To avoid round-off error, this estimate of 380 deaths per 70 years is based on the value 5.4 deaths per year given in Appendix 4-1, rather than the rounded value five deaths per year given in the text.

Table VII. Excess Cancer and PM Mortality with Increased DG Operation

Percent Running as Permitted	Percent Running as DG	Average Run Hours per BUG	Chronic Cancer Cases (per year)	PM Mortality (per year)
100%	0%	100	5	72
90%	10%	190	10	140
80%	20%	280	15	200
70%	30%	370	20	270
60%	40%	460	25	330
50%	50%	550	30	400
40%	60%	640	35	460
30%	70%	730	40	530
20%	80%	820	45	590
10%	90%	910	49	660
0%	100%	1000	54	720
Assumes 100 hours/year for “Running as Permitted” and 1000 hours/year for “Running as DG”				

6.0 Limitations and Uncertainty

There are a variety of limitations and uncertainties in the emissions factors, meteorology, air dispersion modeling, and toxicity; each of these can influence the accuracy of concentration and risk estimates. Nevertheless, these limitations should not be interpreted as precluding action based on assessments that use available information and established methods. The results presented in this report reflect commonly accepted practice or better, and therefore constitute a best estimate of the actual impact of a hypothetical BUG.

The impact of a specific BUG would need to include site-specific information, such as the locations of nearby buildings. The topography of the land can also be important. Here, we have assumed that the emissions source and the receptors are all at the same elevation (ground level). If downwind locations are elevated relative to the BUG due to hills, valleys, or buildings, then the concentrations could be higher than estimated in this report because an elevated receptor can be closer to the centerline of a buoyant plume than a non-elevated receptor.

There are two aspects of the emission factors for diesel engines used here that must be acknowledged. First and foremost, the data quality is low. All EFs in AP-42 are rated from A – E, in terms of the quality of the data and the applicability of the EF to a wide range of specific sources. These ratings are given along with the EFs in Appendix 1. The EFs available for diesel-fired electric generators – with the exception of the EF for particulate matter – received the lowest EPA rating (E), meaning that there is substantial uncertainty in the data. The EF data quality ratings for PM are B and D, respectively, for large and small BUGs.

This low grading of data quality is significant, and indicates a potentially serious lack of information about the actual level of emissions to expect from a BUG. While we believe it is appropriate to use AP-42 because of the paucity of other information, we nevertheless recognize that the significant uncertainty in the EFs influences all of our conclusions about predicted concentrations and health risks. Better information on emissions from current or future studies could improve the robustness and reliability of future health-risk evaluations of diesel back-up generators.

The second limitation of AP-42 is that separate EFs are reported for only two engine categories, large (>600 hp capacity) and small (<600 hp capacity) engines. This approach implies that there is a sudden change in EFs at 600 hp. For example, the EF for PM10, in units of lb/hp-h, is 0.0022 for small engines and 0.0007 for large engines. If a 500 hp and a 1000 hp engine both operate at capacity for one hour, the small engine generates 500 hp-hr of energy and is assumed to emit 1.1 lb of PM10 while the larger generates 1000 hp-hr but only emits 0.77 lb of PM10. This result, that the smaller engine generates half as much energy but emits 57% more PM, is likely to be an artifact of the data rather than representing actual conditions.

Because of the above limitations with AP-42, we investigated the sensitivity of our results to the emissions factors. This sensitivity analysis is summarized here, and presented in more detail in Appendix 2-7. In this sensitivity analysis, we pose the question, what if the EF for large BUGs is too small, while the EF for small BUGs is too large? We first reversed the two EFs by applying the EF for large engines to small engines and the EF for small engines to large engines[41]. Then we used an intermediate EF value of 0.55 g/hp-hr (0.0012 lb/hp-hr) for both large and small engines, as was suggested informally by the ARB[42]. These EF values provide a range of possible emissions and risk results, which are presented in Appendix 2-7 in terms of the size of the risk zone and the number of expected cancer cases and mortalities. Using the state-wide intake fraction approach, we found that reversing the AP-42 EFs caused a 31% increase in excess cancer cases and PM mortality, while the intermediate ARB EF value produced similar results as the original AP-42 EFs (see Table VIII, below). This analysis suggests that within the range of uncertainty, the overall results are not overly sensitive to the PM emission factor.

Table VIII. Emission Factor Sensitivity Analysis - Intake Fraction Approach

	Cancer Cases			PM Mortality		
Emission Factor Source \ Annual Run Hours	100 hours	500 hours	1000 hours	100 hours	500 hours	1000 hours
AP-42	5	27	54	72	360	720
ARB Estimate	5	26	52	70	350	700
AP-42 Reversed	7	36	71	95	480	950

---

[41] If the EF for small BUGs is too large and the EF for large BUGs is too small, then the combination of the original analysis (presented in the "Results" section) and the sensitivity analysis (presented here) will approximately bound the range of possible results, given the uncertainty in EFs.

[42] This value was suggested informally during personal communications with experts at the California Air Resources Board (ARB). However, it is not a value that is officially endorsed by the ARB, and we present it here only to explore the effect of uncertainty in EFs on estimated health risks.

7.0 Conclusion

This report contains a health-risk assessment that accounts for the air pollution impacts of diesel-fired back-up electricity generators (BUG). Among the many specific issues we explored, the three that merit the greatest attention are all due to PM emissions:

- the direct mortality effects owing to PM2.5 emissions.
- the chronic cancer risk owing to diesel particulate matter (DPM) emissions, and
- the risk of exceeding the State of California's 24-hour PM10 standard of 50 $\mu g/m^3$, owing to PM10 emissions.

We predict chronic cancer risk zones that extend many hundreds of meters away from a BUG, depending on the number of hours of operation. A risk zone is defined as the area wherein the chronic cancer risk for exposed individuals is estimated to be greater than 1 per million. We note that the toxicity of PM2.5 in terms of mortality risk is 13 times higher than the chronic cancer toxicity of DPM. Therefore, within the risk zones, the total estimated risk from BUG-related exposures exceeds 10 per million.

Urban areas throughout California already experience a significant number of exceedances of the state 24-hour ambient PM10 standard each year. We conclude that BUG emissions will increase the number of exceedances of this standard in the immediate vicinity of the BUG.

Using an intake fraction approach to BUG emissions, we estimate approximately five additional cancer cases per year due to DPM emissions and an additional approximately 72 deaths/year due to PM2.5 emissions. This estimate is based on the assumption that there are 11,000 BUGs that each run 100 hours, for a cumulative total operating time of 1.1 million hours per year. If some BUGs increase their number of operating hours (e.g., if they are used as distributed energy generation rather than solely as a back-up energy supplies), then the health risks associated with BUGs may increase significantly.

Because we are modeling a generic BUG, we have not included factors that will be significant to the actual impact of real BUGs, such as the locations of nearby buildings and the local topography. These additional factors, which we know will be present in an urban environment, may lead to exposure concentrations under some circumstances that are significantly higher than the predicted concentrations reported in this study.

The Industrial Source Complex (ISC) air dispersion model, which is widely used for emissions sources such as BUGs, does not model the hours for which the meteorological data indicates calm winds. Such conditions prevail 5-20% of the time in urban areas in California. The lack of treatment of calm conditions is a significant limitation of the ISC because it forces the impact analysis to systematically ignore hours when concentrations and the associated public health impacts are expected to be greater than average.

8.0 List of Abbreviations

ACGIH – American Council of Government Industrial Hygienists
AP-42 – The United States Environmental Protection Agency’s compilation of emission factors
ARS – Air Resource Specialists, Inc., located in Fort Collins, Colorado.
ATSDR – Agency for Toxic Substances and Disease Registry
BTU – British Thermal Unit (a unit of energy)
BUG – Back-up Generator
CalEPA – California Environmental Protection Agency
DG – Distributed Generation of electricity
DPM – Diesel Particulate Matter
EF – Emission Factor
EPA – United States Environmental Protection Agency
hp – horsepower (a unit of power). Also written bhp (brake horsepower) to denote the technique used to measure an engine’s horsepower.
hp-h – horsepower-hour (a unit of energy). Also written bhp-h.
ISC – Industrial Source Complex air dispersion model
iF – Intake Fraction
MMBTU – million British thermal units (a unit of energy)
MRL – Maximum Risk Level
NOAA – National Oceanic and Atmospheric Administration
OSHA - Occupational Safety and Health Administration
OEHHA – The California Office of Environmental Health Hazards Assessment
PAH – Polycyclic Aromatic Hydrocarbons
PEL – Permissible Exposure Limit
PM – Particulate Matter
PM2.5 – Particulate Matter with an aerodynamic diameter of 2.5 μm or less.
PM10 – Particulate Matter with an aerodynamic diameter of 10 μm or less.
TLV – Threshold Limit Value
USEPA – United States Environmental Protection Agency

Appendix 1: Model Inputs

The tables contained in this appendix summarize emission factors for diesel engines and the health risk values that correspond to the individual chemicals present in diesel exhaust. Emissions factors are presented separately for small (<600 hp) and large (>600 hp) diesel engines. The health risk values are common to both engine size classes.

Emission factors for all chemicals in this analysis are presented as mass per unit of fuel input (lb/MMBtu or mg/MMBtu). However, the air dispersion modeling used units of power output for PM emission rates (0.0022 lb/hp-hr for small engines, and 0.0007 lb/hp-hr for large engines). As per EPA guidelines[1], we converted from fuel input to power output by multiplying lb/MMBtu by 0.007 to get lb/hp-hr.

Health Risk Value Definitions

Two common methods of characterizing the toxicity of a specific compound is via unit risk factors (URFs) and reference concentrations (RfCs). URF are typically used for chronic cancer risks, and RfCs are typically used for acute risks and for chronic non-cancer risks.

Various governing bodies and agencies spend time reviewing the available literature and establishing URFs and RfCs. For this report, we have focused on values established by California's Office of Environmental Health Hazard Assessment (OEHHA). OEHHA's RfCs are called Reference Exposure Levels (RELs)[2], and these are regulatory-approved toxicity values.

Reference Exposure Level (REL)

The concentration level at or below which no adverse health effects are anticipated for aspecified exposure duration is termed the reference exposure level (REL). RELs are based on the most sensitive, relevant, adverse health effect reported in the medical and toxicological literature. RELs are designed to protect the most sensitive individuals in the population by the inclusion of margins of safety. Since margins of safety are incorporated to address data gaps and uncertainties, exceeding the REL does not automatically indicate an adverse health impact. A chronic REL is an airborne level that would pose no significant health risk to individuals indefinitely exposed to that level.

---

[1] This conversion factor was taken from EPA's database of emissions factors, called AP-42, which is available at http://www.epa.gov/ttn/chief/ap42/ch03/ .

[2] Note that the National Institute for Occupational Safety and Health (NIOSH) has established RfCs, which they call Recommended Exposure Limits (RELs). We have used the OEHHA RELs rather than the NIOSH RELs, to represent individual chemicals' toxicity, so the abbreviation REL refers to an OEHHA Recommended Exposure Level rather than to a NIOSH Recommended Exposure Limit. The OEHHA is more appropriate for environmental conditions while the NIOSH is more appropriate for workplace conditions.

Other examples of RfCs include:

- **Minimal Risk Levels (MRL)**
  MRLs, developed by the Agency for Toxic Substances and Disease Registry (ATSDR), are estimates of daily human exposure to a chemical (i.e., doses expressed in mg/kg/day) that are unlikely to be associated with any appreciable risk of deleterious non-cancer effects over a specified duration of exposure. MRLs are required for Hazardous Substances by the 1980 Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA, commonly known as the Superfund legislation). MRLs are calculated using data from human and animal studies and are reported for acute (< 14 days), intermediate (15-364 days), and chronic (> 365 days) exposures.

- **Permissible Exposure Limit (PEL)**
  Developed by the Occupational Safety and Health Administration (OSHA) to ensure worker safety, the PEL is an 8-hour, time-weighted average. Exposure levels may exceed the PEL (for brief periods), but the sum of the exposure levels averaged over 8 hours must not exceed the limit.

- **Threshold Limit Value (TLV)**
  According to the American Conference of Governmental Industrial Hygienists (ACGIH), the TLV is "the time-weighted average concentration for a normal 8-hour workday and a 40-hour workweek, to which nearly all workers may be repeatedly exposed, day after day, without adverse effect". Many of ACGIH's TLVs were adopted by OSHA for use as PELs. TLVs and PELs, which were designed to protect healthy workers, are usually much higher than the health-based values of ATSDR and EPA, which were designed to protect the health of the general population, including the very young and the elderly. Although the ATSDR does not base any of its community health decisions on TLVs or PELs, agency health assessors and toxicologists may sometimes mention such values in Public Health Assessments or consultations as a means of putting site-specific concentrations of contaminants into some kind of meaningful perspective.

LIST OF TABLES

- **Table 1-1 Emissions Factors for Large Engines**
  Contains EPA AP-42 emission factors (in mg/MMBtu and lb/MMBtu) for engines larger than 600 hp for the main chemicals found in diesel exhaust.
- **Table 1-2 Emissions Factors for Small Engines**
  Contains EPA AP-42 emission factors (in mg/MMBtu and lb/MMBtu) for engines smaller than 600 hp for the main chemicals found in diesel exhaust.
- **Table 1-3 Acute Health Risk Values**
  Contains MRL, REL, TLV, and PEL values for acute health risks for the listed chemicals.

- **Table 1-4 Chronic Health Risk Values**
  Contains MRL, REL, RfC, and EPA cancer risk value of chronic health risks for the listed chemicals. Includes source data and any comments.
- **Table 1-5 Ratio of Emission Factor to Health Risk Factor by Engine Size**
  Contains ratio of emission factors for both large and small engines to acute and chronic REL values as well as cancer risk values for some chemicals.

EPA Emission Factor Ratings

Each AP-42 emission factor is given a rating from A through E, with A being the best. A factor's rating is a general indication of the reliability, or robustness, of that factor. This rating is assigned based on the estimated reliability of the tests used to develop the factor and on both the amount and the representative characteristics of those data. In general, factors based on many observations, or on more widely accepted test procedures, are assigned higher rankings. Conversely, a factor based on a single observation of questionable quality, or one extrapolated from another factor for a similar process, would probably be rated much lower.

EPA emission factor ratings are best characterized as follows:

- **A** - Excellent. Emission factor is developed primarily from A- and B-rated source data taken from many randomly chosen facilities in the industry population. The source category population is sufficiently specific to minimize variability.
- **B** - Above average. Emission factor is developed primarily from A- or B-rated test data from a moderate number of facilities. Although no specific bias is evident, is not clear if the facilities tested represent a random sample of the industry. As with the A rating, the source category population is sufficiently specific to minimize variability.
- **C** - Average. Emission factor is developed primarily from A-, B-, and C-rated test data from a reasonable number of facilities. Although no specific bias is evident, it is not clear if the facilities tested represent a random sample of the industry As with the A rating, the source category population is sufficiently specific to minimize variability.
- **D** - Below average. EF is developed primarily from A-, B- and C-rated test data from a small number of facilities, and there may be reason to suspect that these facilities do not represent a random sample of the industry. There also may be evidence of variability within the source population.
- **E** - Poor. Factor is developed from C- and D-rated test data from a very few number of facilities, and there may be reason to suspect that the facilities tested do not represent a random sample of the industry. There also may be evidence of variability within the source category population.

All of the EPA AP-42 data on emission factors were given a rating of E. More studies are currently being conducted to find more accurate emission factors. At present, the EPA data is the most widely cited source of data on emissions factors.

SOURCES

Environmental Protection Agency (EPA)

- **AP-42, Fifth Edition, Volume 1, Chapter 3.3 Gasoline and Diesel Industrial Engines.** Emission Factors for small and large diesel-fuelled industrial stationary engines.
  http://www.epa.gov/ttn/chief/ap42/ch03/
- **EPA Chemical Profile** - provides basic information about some hazardous chemicals, including TLV values.
  http://www.epa.gov/swercepp/ehs/ehsalpha.html
- **Health Effects Notebook for Hazardous Air Pollutants: Hap Index Hazard Summary** Provides basic information about hazardous chemicals, including health risk data for acute and chronic exposures. Lists TLV, PEL, and REL values for some but not all chemicals.
  http://www.epa.gov/ttn/atw/hapindex.html
- **EPA Integrated Risk Information System** - documents chronic and carcinogenic health effects. RfD, RfC values listed.
  http://www.epa.gov/iris/
- **EPA Procedures for Preparing Emission Factor Documents**
  Explains emission factor rating scheme.
  http://www.epa.gov/ttn/chief/ap42/c00s00.pdf

California Air Resources Board (CARB)

- **Rulemaking on Identifying Particulate Emissions from Diesel-Fueled Engines as a Toxic Air Contaminant**
  Exposure Assessment: Information on emission projections, breakdown of diesel exhaust chemicals, ambient levels in CA for 1990 and 1995, and atmospheric persistence. Health Risk Assessment: Organized by organ system includes: Toxicokenetics, non-cancer effects, Carcinogenic, Reproductive, Developmental, Immunological, Genotoxicity, etc. Almost all in reference to empirical studies conducted on animals.
  http://arbis.arb.ca.gov/regact/diesltac/diesltac.htm
- **Consolidated Table of OEHHA/ARB Approved Risk Assessment Health Values**
  Provides links to both acute and chronic health risk values.
  http://arb.ca.gov/toxics/healthval/healthval.htm
- **OEHHA/ARB Approved Acute Reference Exposure Levels and Target Organs**
  Lists acute RELs and target organs.
  http://www.arb.ca.gov/toxics/healthval/acute.pdf

Office of Environmental Health Hazard Assessment (OEHHA)

- **All Acute Reference Exposure Levels developed by OEHHA as of May 2000**
  Acute RELs, averaging times, and toxicologic endpoints for various chemicals.
  http://www.oehha.org/air/acute_rels/allAcRELs.html

Agency for Toxic Substances and Disease Registry (ATSDR)

- Minimal Risk Levels (MRLs) for Hazardous Substances as required by CERCLA.
  http://www.atsdr.cdc.gov/mrls.html
- Toxic FAQs for substances found at Hazardous Waste sites.
  http://www.atsdr.cdc.gov/toxfaq.html

Table 1-1 Emissions Factors for Large Engines (>600hp)

Chemical	Emission Factors					
	Value	Units (Fuel Input)	Value	Units (Fuel Input)	Source	Emission Factor Rating
Total PAHs	96.2	mg/MMBTu	0.000212	lb/MMBtu	EPA AP-42	E
Acrolein	3.57	mg/MMBTu	0.00000788	lb/MMBtu	EPA AP-42	E
Benzene	352	mg/MMBTu	0.000776	lb/MMBtu	EPA AP-42	E
Formaldehyde	35.8	mg/MMBTu	0.0000789	lb/MMBtu	EPA AP-42	E
Acetaldehyde	11.4	mg/MMBTu	0.0000252	lb/MMBtu	EPA AP-42	E
Toluene	127	mg/MMBTu	0.000281	lb/MMBtu	EPA AP-42	E
Xylenes	87.5	mg/MMBTu	0.000193	lb/MMBtu	EPA AP-42	E
Butadiene	NA		NA			
PM	45,000	mg/MMBTu	0.1	lb/MMBtu	EPA AP-42	B

PAHs						
Naphthalene	59.0	mg/MMBTu	0.00013	lb/MMBtu	EPA AP-42	E
Acenaphthylene	4.19	mg/MMBTu	0.00000923	lb/MMBtu	EPA AP-42	E
Acenaphthene	2.12	mg/MMBTu	0.00000468	lb/MMBtu	EPA AP-42	E
Fluorene	5.81	mg/MMBTu	0.0000128	lb/MMBtu	EPA AP-42	E
Phenanthrene	18.5	mg/MMBTu	0.0000408	lb/MMBtu	EPA AP-42	E
Anthracene	0.558	mg/MMBTu	0.00000123	lb/MMBtu	EPA AP-42	E
Fluoranthene	1.83	mg/MMBTu	0.00000403	lb/MMBtu	EPA AP-42	E
Pyrene	1.68	mg/MMBTu	0.00000371	lb/MMBtu	EPA AP-42	E
Benz(a)anthracene	0.282	mg/MMBTu	0.000000622	lb/MMBtu	EPA AP-42	E
Chrysene	0.694	mg/MMBTu	0.00000153	lb/MMBtu	EPA AP-42	E
Benzo(b)fluoranthene	0.503	mg/MMBTu	0.00000111	lb/MMBtu	EPA AP-42	E
Benzo(k)fluoranthene	< 0.0989	mg/MMBTu	< 0.000000218	lb/MMBtu	EPA AP-42	E
Benzo(a)pyrene	< 0.117	mg/MMBTu	< 0.000000257	lb/MMBtu	EPA AP-42	E
Indeno(1,2,3-cd)anthracene	< 0.188	mg/MMBTu	< 0.000000414	lb/MMBtu	EPA AP-42	E
Dibenz(a,h)anthracene	< 0.157	mg/MMBTu	< 0.000000346	lb/MMBtu	EPA AP-42	E
Benzo(g,h,l)perylene	< 0.252	mg/MMBTu	< 0.000000556	lb/MMBtu	EPA AP-42	E

Table 1-2 Emissions Factors for Small Engines (<600hp)

Chemical	Emission Factor					
	Value	Units (Fuel Input)	Value	Units (Fuel Input)	Source	Emission Factor Rating
Acrolein	< 42.0	mg/MMBTu	< 0.0000925	lb/MMBtu	EPA AP-42	E
Formaldehyde	535	mg/MMBTu	0.00118	lb/MMBtu	EPA AP-42	E
Total PAHs	76.2	mg/MMBTu	0.000168	lb/MMBtu	EPA AP-42	E
Benzene	423	mg/MMBTu	0.000933	lb/MMBtu	EPA AP-42	E
Acetaldehyde	348	mg/MMBTu	0.000767	lb/MMBtu	EPA AP-42	E
Butadiene	< 17.7	mg/MMBTu	< 0.0000391	lb/MMBtu	EPA AP-42	E
Toluene	186	mg/MMBTu	0.000409	lb/MMBtu	EPA AP-42	E
Xylenes	129	NA	0.000285	lb/MMBtu	EPA AP-42	E
PM-10	141,000	mg/MMBTu	0.310	lb/MMBtu	EPA AP-42	D

PAHs						
Naphthalene	38.5	mg/MMBTu	0.0000848	lb/MMBtu	EPA AP-42	E
Acenaphthylene	< 2.30	mg/MMBTu	< 0.00000506	lb/MMBtu	EPA AP-42	E
Acenaphthene	< 0.644	mg/MMBTu	< 0.00000142	lb/MMBtu	EPA AP-42	E
Fluorene	13.2	mg/MMBTu	0.0000292	lb/MMBtu	EPA AP-42	E
Phenanthrene	13.3	mg/MMBTu	0.0000294	lb/MMBtu	EPA AP-42	E
Anthracene	0.848	mg/MMBTu	0.00000187	lb/MMBtu	EPA AP-42	E
Fluoranthene	3.45	mg/MMBTu	0.00000761	lb/MMBtu	EPA AP-42	E
Pyrene	2.17	mg/MMBTu	0.00000478	lb/MMBtu	EPA AP-42	E
Benzo(a)anthracene	0.762	mg/MMBTu	0.00000168	lb/MMBtu	EPA AP-42	E
Chrysene	0.160	mg/MMBTu	0.000000353	lb/MMBtu	EPA AP-42	E
Benzo(b)fluoranthene	< 0.0450	mg/MMBTu	< 0.0000000991	lb/MMBtu	EPA AP-42	E
Benzo(k)fluoranthene	< 0.070	mg/MMBTu	< 0.000000155	lb/MMBtu	EPA AP-42	E
Benzo(a)pyrene	< 0.0853	mg/MMBTu	< 0.000000188	lb/MMBtu	EPA AP-42	E
Indeno(1,2,3-cd)anthracene	< 0.170	mg/MMBTu	< 0.000000375	lb/MMBtu	EPA AP-42	E
Dibenz(a,h)anthracene	< 0.264	mg/MMBTu	< 0.000000583	lb/MMBtu	EPA AP-42	E
Benzo(g,h,l)perylene	< 0.222	mg/MMBTu	< 0.000000489	lb/MMBtu	EPA AP-42	E
Total PAH	76.2	mg/MMBTu	0.000168	lb/MMBtu	EPA AP-42	E

Table 1-3 Acute Health Risk Values

Chemical	Referrence Exposure Level (REL)			
	Value	Units	Hours	Source
Benzene	1300	ug/m3	6	OEHHA
Butadiene	NA			
Formaldehyde	94	ug/m3	1	OEHHA
Acetaldehyde	NA			
Acrolein	0.19	ug/m3	1	OEHHA
Toluene	37,000	ug/m3	1	OEHHA
Xylenes	22,000	ug/m3	1	OEHHA
Total PAHs	NA			
PAHs				
Naphthalene	NA			
Acenaphthylene	NA			
Acenaphthene	NA			
Fluorene	NA			
Phenanthrene	NA			
Anthracene	NA			
Fluoranthene	NA			
Pyrene	NA			
Benz(a)anthracene	NA			
Chrysene	NA			
Benzo(b)fluoranthene	NA			
Benzo(k)fluoranthene	NA			
Benzo(a)pyrene	100	ug/m3		NIOSH
Indeno(1,2,3-cd)anthracene	NA			
Dibenz(a,h)anthracene	NA			
Benzo(g,h,l)perylene	NA			

Comparison Risk Values: Not Used in Analysis

Chemical	Minimum Risk Level (MRL)					Permissible Exposure Limit (PEL)			Threshold Limit Value (TLV)		
	Value	Units	Value	Units	Source	Value	Units	Source	Value	Units	Source
Benzene	162	ug/m3	0.05	ppm	ATSDR	3,260	ug/m3	EPA Hazard Summary (OSHA)	32,000	ug/m3	EPA Hazard Summary
Butadiene	NA					2,200,000	ug/m3	EPA Hazard Summary (OSHA)	22,000	ug/m3	EPA Hazard Summary
Formaldehyde	50.0	ug/m3	0.04	ppm	ATSDR	3,685	ug/m3	EPA Chemical Profile (OSHA)	1,500	ug/m3	EPA Chemical Profile
Acetaldehyde	NA					180,000	ug/m3	EPA Hazard Summary (OSHA)	180,000	ug/m3	EPA Hazard Summary
Acrolein	0.117	ug/m3	5E-05	ppm	ATSDR	250	ug/m3	EPA Hazard Summary (OSHA)	250	ug/m3	EPA Hazard Summary
Toluene	3833	ug/m3	1	ppm	ATSDR	75,000	ug/m3	EPA Hazard Summary (OSHA)	75,000	ug/m3	EPA Hazard Summary
Xylenes	4415	ug/m3	1	ppm	ATSDR	435,000	ug/m3	EPA Hazard Summary (OSHA)	435,000	ug/m3	EPA Hazard Summary
Total PAHs	NA					200	ug/m3	EPA Hazard Summary (OSHA)	200	ug/m3	EPA Hazard Summary
PAHs											
Naphthalene	NA					50,000	ug/m3	EPA Hazard Summary (OSHA)	50,000	ug/m3	EPA Hazard Summary
Acenaphthylene	NA					NA			NA		
Acenaphthene	NA					NA			NA		
Fluorene	NA					NA			2,000	ug/m3	NIOSH
Phenanthrene	NA					NA			1,030,000	ug/m3	EPA Hazard Summary
Anthracene	NA					NA			NA		
Fluoranthene	NA					NA			NA		
Pyrene	NA					NA			NA		
Benz(a)anthracene	NA					NA			NA		
Chrysene	NA					NA			NA		
Benzo(b)fluoranthene	NA					NA			NA		
Benzo(k)fluoranthene	NA					NA			NA		
Benzo(a)pyrene	NA					NA			NA		
Indeno(1,2,3-cd)anthracene	NA					NA			NA		
Dibenz(a,h)anthracene	NA					NA			NA		
Benzo(g,h,l)perylene	NA					NA			NA		

Table 1-4 Chronic Health Risk Values

Chemical	Chronic Reference Exposure Level (REL)		
	Value	Units	Source
Acrolein	0.06	ug/m3	OEHHA
Formaldehyde*	3	ug/m3	OEHHA
Propylene	3000	ug/m3	OEHHA
Total PAHs			
Benzene*	60	ug/m3	OEHHA
Acetaldehyde	9	ug/m3	OEHHA
Butadiene	20	ug/m3	OEHHA
Toluene	300	ug/m3	OEHHA
Xylenes	700	ug/m3	OEHHA
PM-10			
Diesel Exhaust	5	ug/m3	OEHHA
Naphthalene	9	ug/m3	OEHHA

Comparison Health Risk Values: Not used in analysis

Chemical	Minimum Risk Level (MRL)						RfC Non-Carcinogenic			Cancer Risk Unit			Cancer Risk Unit - lower risk value (if a range is given)		
	Value	Units	Value	Units	Source	Comments	Value	Units	Source	Value	Units	Source	Value	Units	Source
Acrolein	0.0210	ug/m3	0.000009	ppm	ATSDR	intermediate	0.02	ug/m3	EPA IRIS						
Formaldehyde*	9.99	ug/m3	0.008	ppm	ATSDR	chronic				0.013	(mg/m3)$^{-1}$	EPA IRIS			
Propylene															
Total PAHs															
Benzene*	13.0	ug/m3	0.004	ppm	ATSDR	intermediate				7.8E-03	(mg/m3)$^{-1}$	EPA IRIS	2.20E-03	(mg/m3)$^{-1}$	EPA IRIS
Acetaldehyde							9	ug/m3	EPA IRIS	2.2E-03	(mg/m3)$^{-1}$	EPA IRIS			
Butadiene										0.28	(mg/m3)$^{-1}$	EPA IRIS			
Toluene	307	ug/m3	0.08	ppm	ATSDR	chronic	400	ug/m3	EPA IRIS						
Xylenes	442	ug/m3	0.1	ppm	ATSDR	chronic									
PM-10							14.4	ug/m3	EPA Health Assessment						
Diesel Exhaust										0.3	(mg/m3)$^{-1}$	OEHHA			
Naphthalene	10.7	ug/m3	0.002	ppm	ATSDR	chronic									

Table 1-5 Ratio of Emission Factor to Health Risk Factor by Engine Size

Acute REL

Chemical	Large (>600 hp)	Small (<600 hp)
Acrolein	18.8	220.8
Formaldehyde	0.381	5.694
Benzene	0.27	0.33
Xylenes	0.004	0.006
Toluene	0.003	0.005
Acetaldehyde	NA	NA
Total PAHs	NA	NA
Butadiene	NA	NA
PM-10	NA	NA

Chronic REL

Chemical	Large (>600 hp)	Small (<600 hp)
Acrolein	60	699
Formaldehyde	12	178
Benzene	5.9	7.1
Acetaldehyde	1.3	39
Xylenes	0.13	0.18
Toluene	0.42	0.62
Total PAHs	NA	NA
Butadiene	NA	NA
PM-10	NA	NA
Naphthalene	NA	NA

Cancer Unit Risk

Chemical	Large (>600 hp)	Small (<600 hp)
Diesel PM	150,000	470,000
Benzene	45,127	54,257
Formaldehyde	7,397	5,862
Acetaldehyde	5,196	158,140
Butadiene	NA	63
Toluene	NA	NA
Acrolein	NA	NA
Total PAHs	NA	NA
Xylenes	NA	NA

EF measured in g/hp-hr

REL measured in ug/m^3

Appendix 2: Model Results

This appendix contains tables summarizing the air modeling results. The results are based on meteorological data from EPA's SCRAM database for the five main cities, Los Angeles, San Diego, San Francisco, and Fresno, from 1987-1991, and from 1986-87 and 1989-91 for Sacramento. The model estimates PM missions from two different engine sizes (500 hp and 1500 hp) at each location throughout the five year time span. The emissions are modeled to distances of 5000 meters from the engine. Using health risk data we then show the short and long term risks at each location and distance from the BUG.

LIST OF TABLES

Tables 2-1 to 2-4 are presented for each of the five cities modeled: Fresno, Los Angeles, Sacramento, San Diego, and San Francisco (i.e. LA1, LA2, LA3, LA4).

- **Table 1: Dispersion Model Output**

  This table contains the actual air model results based on 1987-1991 meteorological data from each city. PM emissions, which are modeled for two engine sizes (500 hp and 1500 hp), are expressed in micrograms per cubic meter ($\mu g/m^3$). Concentrations are reported every 10 meters from the source out to 200 meters, then every 100 meters to 1000 meters, then every 1000 meters out to 5000 meters.

  The emission rates for PM, in pounds per hour (lb/hr), are derived from the EPA's *Compilation of Air Pollution Emission Factors* AP-42 document as follows:

  500 hp engine:
  Emission Rate = 140615 mg/MMBtu * (0.007 MMBtu / hp-hr) * (500 hp) * (g/1000mg) * (lb/454 g) = 1.1 pounds/hour
  1500hp engine:
  Emission Rate = 45360 mg/MMBtu * (0.007 MMBtu / hp-hr) * (1500 hp) * (g/1000mg) * (lb/454 g) = 1.05 pounds/hour

  Note that MMBtu refers to heat energy in, and hp-hr refers to energy produced by the engine. The unit conversion of 7000 Btu/hp-hr, or 0.007 MMBtu/hp-hr, accounts for both the unit conversion and for the efficiency of the engine. See AP-42, Vol. 1, Ch 3.3, page 6.

  Model outputs, which are in terms of the predicted concentration at a number of specific locations, are given for three different averaging periods: 1-hour maximum, 24-hour maximum, and annual average. Because wind direction does not have a large effect on 1-hour and 24-hr isopleths, the plots are relatively symmetrical. For both we measured the maximum concentration at each distance. The annual isopleths are not symmetrical and reflecte the impact wind direction has on PM concentrations. We measured the concentrations at points upwind and downwind from the generator based on local wind patterns for each city. Downwind concentrations are generally much higher than upwind concentrations.

Wind Direction:	**Upwind**	**Downwind**
Los Angeles	SW	NE
Sacramento	SW	NE
San Diego	NW	SE
Fresno	SW	SE
San Francisco	NW	SE

We have modeled three different operating scenarios, which reflect the hours when BUGs are assumed to operate. For the *all scenario*, BUGs may operate and emit any hour of the year. For the *summer* scenario, BUG operation is modeled as occurring only during the months of June through September and only between 12pm and 6pm. The *business* scenario assumes that BUG operation would occur during any month, but only between 7am and 7pm.

The hours per year when a BUG could potentially operate under these three scenarios are 8760 hours for *all*, 4380 for *business*, and 732 for *summer*. The amount of time the BUG actually did operate was assumed to be either 50, 100, or 200 hours per year of BUG operation. The annual average concentration was calculated by ratioing the model PM prediction using the assumed hours divided by the model operating hours. For example, with a 50 hour per year run time, the *all* scenario concentrations were determined by multiplying the *all* scenario model results by 50/8760, and the *business* scenario concentrations were determined by multiplying the *business* scenario model results by 50/4380. The *summer* scenario concentration, because it runs only 122 days out of the year, were ratioed by 50/732*122/365 to predict the concentrations for 50 hours per year of run time.

- **Table 2: Acrolein Hazard Index**

  Because the model reported concentrations of PM, we needed to ratio these numbers to show concentrations of other toxic substances. To derive the concentration of Acrolein from the PM concentrations, we multiplied the PM concentration by the Acrolein emission factor (42 mg/MMBtu for 500hp engines, 3.57 mg/MMBtu for 1500hp engines) and then divide by the PM emission factor (140615 mg/MMBtu for 500hp, 45360 mg/MMBtu for 1500hp). These calculations can be found in “Data” for Table 2.

  Once we found the Acrolein concentrations, we compared them with a health risk standard developed by OEHHA called the Reference Exposure Level (REL). For Acrolein, the REL is 0.19 ug/m^3. In Table 2 we show the concentration of Acrolein as a fraction of the REL for each scenario and each engine size. This fraction, which is the modeled concentration divided by the REL, is often called a Hazard Index (HI). A larger HI indicates are more significant potential health risk.

- **Table 3: 24-hour Average Concentrations**
  In this table we show PM concentrations as a percent of the California state 24-hour standard for PM10 of 50 ug/m^3 for each scenario and engine size.

- **Table 4: Annual Average Chronic Cancer Risk**
  To calculate the chronic cancer risk at each distance from the source, we multiply the concentration of PM in Table 1 by the OEHHA chronic cancer risk value (300 per million per ug/m^3).

- **Table 2-5: Maximum Annual Average**
  The dispersion model outputs the maximum annual average concentration modeled in every direction around a BUG. For our analysis in Tables 1-4, we look only at the upwind and downwind vectors from the BUG. For this reason, the maximum annual average value in this table may differ slightly from the concentrations presented in previous tables. Note that the maximum annual average concentration is often called the annual average for the maximally exposed individual (MEI)

- **Table 2-6: Risk Zones**
  This table shows the distance from the modeled BUG where a specified level of cancer risk is reached in each scenario for each location. Risk values of 0.5 per million, 1 per million, 5, 10, 50 and 100 per million are charted. To calculate the farthest distance from the BUG at which each cancer risk was present, we used the cancer risk per million data at each distance interval in Table 2-5 to interpolate the exact distance.

LIST OF TABLES BY LOCATION

Table LA1: Model Results for Los Angeles

concentrations in micrograms/m^3

Model Run number	Name	Engine Size (hp)	PM Emissions (lb/hr)	Hours of run time per year	Model outputs	Scenario	Wind	Max	Distance Downwind (meters)*										
									14	28	42	57	71	85	99	113	127	141	156
1	LA-1H-all-500	500	1.1	8760	max 1-hour	all		62.8	18.520	62.790	61.540	54.010	47.250	41.780	37.540	33.950	30.510	28.090	25.620
2	LA-1H-all-1500	1500	1.05	8760	max 1-hour	all		20.9	19.260	20.870	19.410	17.540	15.610	14.060	12.720	11.750	10.900	10.050	9.370
3	LA-1H-sum-500	500	1.1	732	max 1-hour	summer		45.8	10.430	45.790	43.310	40.780	36.120	20.170	24.930	20.440	17.460	14.560	12.290
4	LA-1H-sum-1500	1500	1.05	732	max 1-hour	summer		11.8	0.016	4.620	10.610	11.560	11.750	11.060	10.050	9.930	9.390	8.730	7.990
5	LA-1H-bus-500	500	1.1	4380	max 1-hour	business		60.2	19.210	60.210	60.150	54.190	47.140	41.840	37.390	33.680	30.650	28.220	25.710
6	LA-1H-bus-1500	1500	1.05	4380	max 1-hour	business		20.8	0.210	8.870	16.430	20.800	19.270	16.900	15.310	14.080	12.870	11.690	10.820
7	LA-24H-all-500	500	1.1	8760	24-hour	all		19.3	1.523	15.003	19.288	18.238	15.000	12.069	10.066	8.858	7.773	6.827	6.014
8	LA-24H-all-1500	1500	1.05	8760	24-hour	all		5.5	0.002	0.758	3.229	5.147	5.484	5.215	5.100	4.735	4.312	3.914	3.572
9	LA-H-sum-500	500	1.1	732	24-hour	summer		8.1	0.973	7.237	8.072	6.765	5.496	4.683	3.917	3.273	2.751	2.332	1.995
10	LA-24H-sum-1500	1500	1.05	732	24-hour	summer		2.2	0.001	0.431	1.281	2.056	2.243	2.120	1.891	1.649	1.453	1.321	1.222
11	LA-24H-bus-500	500	1.1	4380	24-hour	business		14.3	1.523	9.805	14.291	13.397	11.415	9.374	7.725	6.554	5.642	4.929	4.362
12	LA-24H-bus-1500	1500	1.05	4380	24-hour	business		3.8	0.002	0.758	2.438	3.029	3.615	3.833	3.664	3.414	3.180	2.913	2.660
13	LA-ann50-all-500d	500	1.1	50	annual	all	downwind	0.017	8.37E-04	1.19E-02	1.73E-02	1.72E-02	1.51E-02	1.28E-02	1.08E-02	9.26E-03	8.05E-03	7.09E-03	6.33E-03
	LA-ann50-all-500u	500	1.1	50	annual	all	upwind	0.003	2.60E-05	9.85E-04	2.16E-03	2.73E-03	2.79E-03	2.63E-03	2.45E-03	2.30E-03	2.18E-03	2.08E-03	2.00E-03
14	LA-ann100-all-500d	500	1.1	100	annual	all	downwind	0.035	1.67E-03	2.39E-02	3.47E-02	3.44E-02	3.02E-02	2.56E-02	2.16E-02	1.85E-02	1.61E-02	1.42E-02	1.27E-02
	LA-ann100-all-500u	500	1.1	100	annual	all	upwind	0.006	5.21E-05	1.97E-03	4.33E-03	5.47E-03	5.58E-03	5.27E-03	4.90E-03	4.60E-03	4.37E-03	4.17E-03	4.00E-03
15	LA-ann200-all-500d	500	1.1	200	annual	all	downwind	0.069	3.35E-03	4.77E-02	6.93E-02	6.87E-02	6.04E-02	5.12E-02	4.33E-02	3.70E-02	3.22E-02	2.84E-02	2.53E-02
	LA-ann200-all-500u	500	1.1	200	annual	all	upwind	0.011	1.04E-04	3.94E-03	8.65E-03	1.09E-02	1.12E-02	1.05E-02	9.80E-03	9.20E-03	8.74E-03	8.33E-03	7.99E-03
16	LA-ann500-all-500d	500	1.1	500	annual	all	downwind	0.173	8.37E-03	1.19E-01	1.73E-01	1.72E-01	1.51E-01	1.28E-01	1.08E-01	9.26E-02	8.05E-02	7.09E-02	6.33E-02
	LA-ann500-all-500u	500	1.1	500	annual	all	upwind	0.028	2.60E-04	9.85E-03	2.16E-02	2.73E-02	2.79E-02	2.63E-02	2.45E-02	2.30E-02	2.18E-02	2.08E-02	2.00E-02
17	LA-ann1000-all-500d	500	1.1	1000	annual	all	downwind	0.347	1.67E-02	2.39E-01	3.47E-01	3.44E-01	3.02E-01	2.56E-01	2.16E-01	1.85E-01	1.61E-01	1.42E-01	1.27E-01
	LA-ann1000-all-500u	500	1.1	1000	annual	all	upwind	0.056	5.21E-04	1.97E-02	4.33E-02	5.47E-02	5.58E-02	5.27E-02	4.90E-02	4.60E-02	4.37E-02	4.17E-02	4.00E-02
18	LA-ann50-all-1500d	1500	1.05	50	annual	all	downwind	0.004	1.14E-07	2.41E-04	1.64E-03	3.23E-03	4.13E-03	4.45E-03	4.44E-03	4.27E-03	4.03E-03	3.77E-03	3.52E-03
	LA-ann50-all-1500u	1500	1.05	50	annual	all	upwind	0.001	0.00E+00	8.33E-06	8.70E-05	2.47E-04	4.10E-04	5.42E-04	6.38E-04	7.04E-04	7.52E-04	7.80E-04	8.00E-04
19	LA-ann100-all-1500d	1500	1.05	100	annual	all	downwind	0.009	2.28E-07	4.82E-04	3.27E-03	6.46E-03	8.26E-03	8.90E-03	8.88E-03	8.53E-03	8.06E-03	7.54E-03	7.03E-03
	LA-ann100-all-1500u	1500	1.05	100	annual	all	upwind	0.002	0.00E+00	1.67E-05	1.74E-04	4.93E-04	8.20E-04	1.08E-03	1.28E-03	1.41E-03	1.50E-03	1.56E-03	1.60E-03
20	LA-ann200-all-1500d	1500	1.05	200	annual	all	downwind	0.018	4.57E-07	9.63E-04	6.54E-03	1.29E-02	1.65E-02	1.78E-02	1.78E-02	1.71E-02	1.61E-02	1.51E-02	1.41E-02
	LA-ann200-all-1500u	1500	1.05	200	annual	all	upwind	0.003	0.00E+00	3.33E-05	3.48E-04	9.87E-04	1.64E-03	2.17E-03	2.55E-03	2.82E-03	3.01E-03	3.12E-03	3.20E-03
21	LA-ann500-all-1500d	1500	1.05	500	annual	all	downwind	0.045	1.14E-06	2.41E-03	1.64E-02	3.23E-02	4.13E-02	4.45E-02	4.44E-02	4.27E-02	4.03E-02	3.77E-02	3.52E-02
	LA-ann500-all-1500u	1500	1.05	500	annual	all	upwind	0.008	0.00E+00	8.33E-05	8.70E-04	2.47E-03	4.10E-03	5.42E-03	6.38E-03	7.04E-03	7.52E-03	7.80E-03	8.00E-03
22	LA-ann1000-all-1500d	1500	1.05	1000	annual	all	downwind	0.089	2.28E-06	4.82E-03	3.27E-02	6.46E-02	8.26E-02	8.90E-02	8.88E-02	8.53E-02	8.06E-02	7.54E-02	7.03E-02
	LA-ann1000-all-1500u	1500	1.05	1000	annual	all	upwind	0.016	0.00E+00	1.67E-04	1.74E-03	4.93E-03	8.20E-03	1.08E-02	1.28E-02	1.41E-02	1.50E-02	1.56E-02	1.60E-02
23	LA-ann50-sum-500d	500	1.1	50	annual	summer	downwind	0.036	2.58E-03	2.88E-02	3.56E-02	3.06E-02	2.42E-02	1.89E-02	1.49E-02	1.20E-02	9.76E-03	8.09E-03	6.80E-03
	LA-ann50-sum-500u	500	1.1	50	annual	summer	upwind	0.000	0.00E+00	2.37E-05	7.85E-05	1.04E-04	1.02E-04	8.97E-05	7.65E-05	6.46E-05	5.48E-05	4.68E-05	4.02E-05
24	LA-ann100-sum-500d	500	1.1	100	annual	summer	downwind	0.071	5.17E-03	5.76E-02	7.11E-02	6.12E-02	4.83E-02	3.77E-02	2.98E-02	2.39E-02	1.95E-02	1.62E-02	1.36E-02
	LA-ann100-sum-500u	500	1.1	100	annual	summer	upwind	0.000	0.00E+00	4.75E-05	1.57E-04	2.09E-04	2.04E-04	1.79E-04	1.53E-04	1.29E-04	1.10E-04	9.36E-05	8.04E-05
25	LA-ann200-sum-500d	500	1.1	200	annual	summer	downwind	0.142	1.03E-02	1.15E-01	1.42E-01	1.22E-01	9.66E-02	7.55E-02	5.96E-02	4.78E-02	3.90E-02	3.24E-02	2.72E-02
	LA-ann200-sum-500u	500	1.1	200	annual	summer	upwind	0.000	0.00E+00	9.50E-05	3.14E-04	4.17E-04	4.07E-04	3.59E-04	3.06E-04	2.58E-04	2.19E-04	1.87E-04	1.61E-04
26	LA-ann500-sum-500d	500	1.1	500	annual	summer	downwind	0.356	2.58E-02	2.88E-01	3.56E-01	3.06E-01	2.42E-01	1.89E-01	1.49E-01	1.20E-01	9.76E-02	8.09E-02	6.80E-02
	LA-ann500-sum-500u	500	1.1	500	annual	summer	upwind	0.001	0.00E+00	2.37E-04	7.85E-04	1.04E-03	1.02E-03	8.97E-04	7.65E-04	6.46E-04	5.48E-04	4.68E-04	4.02E-04
27	LA-ann50-sum-1500d	1500	1.05	50	annual	summer	downwind	0.010	4.57E-07	8.30E-04	4.70E-03	8.22E-03	9.53E-03	9.39E-03	8.63E-03	7.68E-03	6.75E-03	5.92E-03	5.19E-03
	LA-ann50-sum-1500u	1500	1.05	50	annual	summer	upwind	0.000	0.00E+00	0.00E+00	4.57E-07	4.34E-06	1.16E-05	1.83E-05	2.24E-05	2.42E-05	2.44E-05	2.37E-05	2.26E-05
28	LA-ann100-sum-1500d	1500	1.05	100	annual	summer	downwind	0.019	9.13E-07	1.66E-03	9.40E-03	1.64E-02	1.91E-02	1.88E-02	1.73E-02	1.54E-02	1.35E-02	1.18E-02	1.04E-02
	LA-ann100-sum-1500u	1500	1.05	100	annual	summer	upwind	0.000	0.00E+00	0.00E+00	9.13E-07	8.68E-06	2.33E-05	3.65E-05	4.47E-05	4.84E-05	4.89E-05	4.75E-05	4.52E-05
29	LA-ann200-sum-1500d	1500	1.05	200	annual	summer	downwind	0.038	1.83E-06	3.32E-03	1.88E-02	3.29E-02	3.81E-02	3.76E-02	3.45E-02	3.07E-02	2.70E-02	2.37E-02	2.07E-02
	LA-ann200-sum-1500u	1500	1.05	200	annual	summer	upwind	0.000	0.00E+00	0.00E+00	1.83E-06	1.74E-05	4.66E-05	7.31E-05	8.95E-05	9.68E-05	9.77E-05	9.50E-05	9.04E-05
30	LA-ann500-sum-1500d	1500	1.05	500	annual	summer	downwind	0.095	4.57E-06	8.30E-03	4.70E-02	8.22E-02	9.53E-02	9.39E-02	8.63E-02	7.68E-02	6.75E-02	5.92E-02	5.19E-02
	LA-ann500-sum-1500u	1500	1.05	500	annual	summer	upwind	0.000	0.00E+00	0.00E+00	4.57E-06	4.34E-05	1.16E-04	1.83E-04	2.24E-04	2.42E-04	2.44E-04	2.37E-04	2.26E-04
31	LA-ann50-bus-500d	500	1.1	50	annual	business	downwind	0.032	1.66E-03	2.29E-02	3.17E-02	2.96E-02	2.49E-02	2.03E-02	1.66E-02	1.37E-02	1.14E-02	9.70E-03	8.33E-03
	LA-ann50-bus-500u	500	1.1	50	annual	business	upwind	0.004	3.79E-05	1.58E-03	3.38E-03	4.06E-03	3.95E-03	3.54E-03	3.08E-03	2.67E-03	2.31E-03	2.01E-03	1.76E-03
32	LA-ann100-bus-500d	500	1.1	100	annual	business	downwind	0.063	3.32E-03	4.59E-02	6.33E-02	5.93E-02	4.97E-02	4.06E-02	3.31E-02	2.74E-02	2.29E-02	1.94E-02	1.67E-02
	LA-ann100-bus-500u	500	1.1	100	annual	business	upwind	0.008	7.58E-05	3.16E-03	6.77E-03	8.13E-03	7.90E-03	7.08E-03	6.16E-03	5.33E-03	4.62E-03	4.03E-03	3.53E-03
33	LA-ann200-bus-500d	500	1.1	200	annual	business	downwind	0.127	6.65E-03	9.17E-02	1.27E-01	1.19E-01	9.95E-02	8.12E-02	6.63E-02	5.47E-02	4.58E-02	3.88E-02	3.33E-02
	LA-ann200-bus-500u	500	1.1	200	annual	business	upwind	0.016	1.52E-04	6.31E-03	1.35E-02	1.63E-02	1.58E-02	1.42E-02	1.23E-02	1.07E-02	9.24E-03	8.05E-03	7.06E-03
34	LA-ann500-bus-500d	500	1.1	500	annual	business	downwind	0.317	1.66E-02	2.29E-01	3.17E-01	2.96E-01	2.49E-01	2.03E-01	1.66E-01	1.37E-01	1.14E-01	9.70E-02	8.33E-02
	LA-ann500-bus-500u	500	1.1	500	annual	business	upwind	0.041	3.79E-04	1.58E-02	3.38E-02	4.06E-02	3.95E-02	3.54E-02	3.08E-02	2.67E-02	2.31E-02	2.01E-02	1.76E-02
35	LA-ann1000-bus-500d	500	1.1	1000	annual	business	downwind	0.633	3.32E-02	4.59E-01	6.33E-01	5.93E-01	4.97E-01	4.06E-01	3.31E-01	2.74E-01	2.29E-01	1.94E-01	1.67E-01
	LA-ann1000-bus-500u	500	1.1	1000	annual	business	upwind	0.081	7.58E-04	3.16E-02	6.77E-02	8.13E-02	7.90E-02	7.08E-02	6.16E-02	5.33E-02	4.62E-02	4.03E-02	3.53E-02
36	LA-ann50-bus-1500d	1500	1.05	50	annual	business	downwind	0.008	2.28E-07	4.77E-04	3.20E-03	6.22E-03	7.75E-03	8.11E-03	7.84E-03	7.29E-03	6.65E-03	6.02E-03	5.43E-03
	LA-ann50-bus-1500u	1500	1.05	50	annual	business	upwind	0.001	0.00E+00	6.74E-06	1.17E-04	3.75E-04	6.34E-04	8.16E-04	9.17E-04	9.55E-04	9.53E-04	9.25E-04	8.83E-04
37	LA-ann100-bus-1500d	1500	1.05	100	annual	business	downwind	0.016	4.57E-07	9.54E-04	6.41E-03	1.24E-02	1.55E-02	1.62E-02	1.57E-02	1.46E-02	1.33E-02	1.20E-02	1.09E-02
	LA-ann100-bus-1500u	1500	1.05	100	annual	business	upwind	0.002	0.00E+00	1.35E-05	2.34E-04	7.50E-04	1.27E-03	1.63E-03	1.83E-03	1.91E-03	1.91E-03	1.85E-03	1.77E-03
38	LA-ann200-bus-1500d	1500	1.05	200	annual	business	downwind	0.032	9.13E-07	1.91E-03	1.28E-02	2.49E-02	3.10E-02	3.25E-02	3.14E-02	2.92E-02	2.66E-02	2.41E-02	2.17E-02
	LA-ann200-bus-1500u	1500	1.05	200	annual	business	upwind	0.004	0.00E+00	2.69E-05	4.68E-04	1.50E-03	2.54E-03	3.26E-03	3.67E-03	3.82E-03	3.81E-03	3.70E-03	3.53E-03
39	LA-ann500-bus-1500d	1500	1.05	500	annual	business	downwind	0.081	2.28E-06	4.77E-03	3.20E-02	6.22E-02	7.75E-02	8.11E-02	7.84E-02	7.29E-02	6.65E-02	6.02E-02	5.43E-02
	LA-ann500-bus-1500u	1500	1.05	500	annual	business	upwind	0.010	0.00E+00	6.74E-05	1.17E-03	3.75E-03	6.34E-03	8.16E-03	9.17E-03	9.55E-03	9.53E-03	9.25E-03	8.83E-03
40	LA-ann1000-bus-1500d	1500	1.05	1000	annual	business	downwind	0.162	4.57E-06	9.54E-03	6.41E-02	1.24E-01	1.55E-01	1.62E-01	1.57E-01	1.46E-01	1.33E-01	1.20E-01	1.09E-01
	LA-ann1000-bus-1500u	1500	1.05	1000	annual	business	upwind	0.019	0.00E+00	1.35E-04	2.34E-03	7.50E-03	1.27E-02	1.63E-02	1.83E-02	1.91E-02	1.91E-02	1.85E-02	1.77E-02

*The distance downwind from the BUG represents the distance along a diagonal line in a coordinate grid.

Model Run number	**Name**	170	184	198	212	226	240	255	269	283	424	566	707	849	990	1131	1273	1414	1556	1697
1	LA-1H-all-500	24.040	22.530	21.000	19.520	18.120	16.820	15.750	15.840	15.850	13.180	10.070	7.820	6.240	5.120	4.300	3.680	3.200	2.820	2.510
2	LA-1H-all-1500	8.850	8.330	7.860	7.500	7.120	6.760	6.470	8.110	6.700	5.700	4.810	4.110	3.540	3.090	2.730	2.440	2.200	1.990	1.820
3	LA-1H-sum-500	10.750	9.300	8.140	7.190	6.350	5.720	5.180	4.620	4.250	1.770	1.150	0.750	0.540	0.400	0.310	0.260	0.210	0.170	0.140
4	LA-1H-sum-1500	7.310	6.690	6.010	5.470	5.000	4.550	4.150	3.860	3.660	1.770	1.050	0.700	0.500	0.390	0.300	0.230	0.200	0.160	0.140
5	LA-1H-bus-500	24.010	22.490	20.950	19.470	18.050	16.740	15.640	15.240	14.810	11.940	9.240	7.330	5.920	4.890	4.110	3.550	3.100	2.730	2.440
6	LA-1H-bus-1500	10.110	10.150	9.650	9.220	8.850	8.450	8.030	7.670	7.300	7.000	6.120	5.150	4.410	3.810	3.350	2.910	2.600	2.320	2.100
7	LA-24H-all-500	5.320	4.829	4.524	4.261	4.029	3.819	3.623	3.442	3.274	2.101	1.551	1.175	0.920	0.742	0.614	0.518	0.444	0.387	0.340
8	LA-24H-all-1500	3.287	3.044	2.842	2.673	2.528	2.404	2.289	2.184	2.091	1.454	1.073	0.878	0.725	0.605	0.513	0.441	0.384	0.338	0.300
9	LA-H-sum-500	1.722	1.498	1.315	1.162	1.033	0.925	0.832	0.753	0.684	0.317	0.182	0.129	0.100	0.081	0.067	0.056	0.049	0.042	0.038
10	LA-24H-sum-1500	1.122	1.026	0.938	0.857	0.784	0.719	0.660	0.608	0.560	0.281	0.167	0.110	0.083	0.068	0.058	0.049	0.043	0.038	0.034
11	LA-24H-bus-500	3.901	3.518	3.190	2.909	2.666	2.454	2.267	2.102	1.954	1.169	0.842	0.633	0.495	0.401	0.335	0.285	0.248	0.218	0.195
12	LA-24H-bus-1500	2.433	2.233	2.056	1.916	1.794	1.683	1.582	1.490	1.406	0.843	0.581	0.469	0.386	0.324	0.278	0.241	0.213	0.190	0.171
13	LA-ann50-all-500d	5.70E-03	5.18E-03	4.74E-03	4.36E-03	4.03E-03	3.73E-03	3.48E-03	3.24E-03	3.04E-03	1.73E-03	1.12E-03	7.81E-04	5.79E-04	4.48E-04	3.59E-04	2.95E-04	2.47E-04	2.11E-04	1.83E-04
	LA-ann50-all-500u	1.92E-03	1.84E-03	1.77E-03	1.70E-03	1.63E-03	1.56E-03	1.50E-03	1.44E-03	1.38E-03	9.00E-04	6.19E-04	4.50E-04	3.43E-04	2.71E-04	2.21E-04	1.84E-04	1.56E-04	1.35E-04	1.18E-04
14	LA-ann100-all-500d	1.14E-02	1.04E-02	9.48E-03	8.71E-03	8.05E-03	7.47E-03	6.95E-03	6.49E-03	6.07E-03	3.46E-03	2.23E-03	1.56E-03	1.16E-03	8.97E-04	7.18E-04	5.90E-04	4.95E-04	4.22E-04	3.66E-04
	LA-ann100-all-500u	3.84E-03	3.69E-03	3.54E-03	3.40E-03	3.26E-03	3.13E-03	3.00E-03	2.87E-03	2.75E-03	1.80E-03	1.24E-03	8.99E-04	6.85E-04	5.42E-04	4.41E-04	3.68E-04	3.12E-04	2.70E-04	2.36E-04
15	LA-ann200-all-500d	2.28E-02	2.07E-02	1.90E-02	1.74E-02	1.61E-02	1.49E-02	1.39E-02	1.30E-02	1.21E-02	6.92E-03	4.46E-03	3.12E-03	2.32E-03	1.79E-03	1.44E-03	1.18E-03	9.90E-04	8.45E-04	7.32E-04
	LA-ann200-all-500u	7.67E-03	7.37E-03	7.08E-03	6.80E-03	6.52E-03	6.25E-03	5.99E-03	5.74E-03	5.50E-03	3.60E-03	2.47E-03	1.80E-03	1.37E-03	1.08E-03	8.82E-04	7.36E-04	6.25E-04	5.39E-04	4.71E-04
16	LA-ann500-all-500d	5.70E-02	5.18E-02	4.74E-02	4.36E-02	4.03E-02	3.73E-02	3.48E-02	3.24E-02	3.04E-02	1.73E-02	1.12E-02	7.81E-03	5.79E-03	4.48E-03	3.59E-03	2.95E-03	2.47E-03	2.11E-03	1.83E-03
	LA-ann500-all-500u	1.92E-02	1.84E-02	1.77E-02	1.70E-02	1.63E-02	1.56E-02	1.50E-02	1.44E-02	1.38E-02	9.00E-03	6.19E-03	4.50E-03	3.43E-03	2.71E-03	2.21E-03	1.84E-03	1.56E-03	1.35E-03	1.18E-03
17	LA-ann1000-all-500d	1.14E-01	1.04E-01	9.48E-02	8.71E-02	8.05E-02	7.47E-02	6.95E-02	6.49E-02	6.07E-02	3.46E-02	2.23E-02	1.56E-02	1.16E-02	8.97E-03	7.18E-03	5.90E-03	4.95E-03	4.22E-03	3.66E-03
	LA-ann1000-all-500u	3.84E-02	3.69E-02	3.54E-02	3.40E-02	3.26E-02	3.13E-02	3.00E-02	2.87E-02	2.75E-02	1.80E-02	1.24E-02	8.99E-03	6.85E-03	5.42E-03	4.41E-03	3.68E-03	3.12E-03	2.70E-03	2.36E-03
18	LA-ann50-all-1500d	3.27E-03	3.05E-03	2.85E-03	2.67E-03	2.51E-03	2.37E-03	2.24E-03	2.12E-03	2.01E-03	1.27E-03	8.77E-04	6.41E-04	4.89E-04	3.86E-04	3.14E-04	2.61E-04	2.21E-04	1.90E-04	1.65E-04
	LA-ann50-all-1500u	8.06E-04	8.08E-04	8.05E-04	8.00E-04	7.93E-04	7.85E-04	7.74E-04	7.63E-04	7.50E-04	5.94E-04	4.55E-04	3.52E-04	2.80E-04	2.28E-04	1.89E-04	1.60E-04	1.38E-04	1.20E-04	1.06E-04
19	LA-ann100-all-1500d	6.54E-03	6.10E-03	5.70E-03	5.34E-03	5.02E-03	4.74E-03	4.47E-03	4.24E-03	4.02E-03	2.54E-03	1.75E-03	1.28E-03	9.78E-04	7.72E-04	6.28E-04	5.21E-04	4.41E-04	3.79E-04	3.30E-04
	LA-ann100-all-1500u	1.61E-03	1.62E-03	1.61E-03	1.60E-03	1.59E-03	1.57E-03	1.55E-03	1.53E-03	1.50E-03	1.19E-03	9.09E-04	7.05E-04	5.60E-04	4.55E-04	3.78E-04	3.20E-04	2.75E-04	2.40E-04	2.11E-04
20	LA-ann200-all-1500d	1.31E-02	1.22E-02	1.14E-02	1.07E-02	1.00E-02	9.47E-03	8.95E-03	8.47E-03	8.04E-03	5.09E-03	3.51E-03	2.56E-03	1.96E-03	1.54E-03	1.26E-03	1.04E-03	8.82E-04	7.58E-04	6.61E-04
	LA-ann200-all-1500u	3.22E-03	3.23E-03	3.22E-03	3.20E-03	3.17E-03	3.14E-03	3.10E-03	3.05E-03	3.00E-03	2.38E-03	1.82E-03	1.41E-03	1.12E-03	9.10E-04	7.56E-04	6.40E-04	5.50E-04	4.79E-04	4.22E-04
21	LA-ann500-all-1500d	3.27E-02	3.05E-02	2.85E-02	2.67E-02	2.51E-02	2.37E-02	2.24E-02	2.12E-02	2.01E-02	1.27E-02	8.77E-03	6.41E-03	4.89E-03	3.86E-03	3.14E-03	2.61E-03	2.21E-03	1.90E-03	1.65E-03
	LA-ann500-all-1500u	8.06E-03	8.08E-03	8.05E-03	8.00E-03	7.93E-03	7.85E-03	7.74E-03	7.63E-03	7.50E-03	5.94E-03	4.55E-03	3.52E-03	2.80E-03	2.28E-03	1.89E-03	1.60E-03	1.38E-03	1.20E-03	1.06E-03
22	LA-ann1000-all-1500d	6.54E-02	6.10E-02	5.70E-02	5.34E-02	5.02E-02	4.74E-02	4.47E-02	4.24E-02	4.02E-02	2.54E-02	1.75E-02	1.28E-02	9.78E-03	7.72E-03	6.28E-03	5.21E-03	4.41E-03	3.79E-03	3.30E-03
	LA-ann1000-all-1500u	1.61E-02	1.62E-02	1.61E-02	1.60E-02	1.59E-02	1.57E-02	1.55E-02	1.53E-02	1.50E-02	1.19E-02	9.09E-03	7.05E-03	5.60E-03	4.55E-03	3.78E-03	3.20E-03	2.75E-03	2.40E-03	2.11E-03
23	LA-ann50-sum-500d	5.79E-03	4.98E-03	4.33E-03	3.80E-03	3.35E-03	2.98E-03	2.67E-03	2.40E-03	2.17E-03	9.66E-04	5.38E-04	3.40E-04	2.33E-04	1.69E-04	1.28E-04	9.98E-05	8.01E-05	6.58E-05	5.50E-05
	LA-ann50-sum-500u	3.47E-05	3.04E-05	2.67E-05	2.35E-05	2.10E-05	1.87E-05	1.69E-05	1.53E-05	1.39E-05	6.39E-06	3.65E-06	2.28E-06	1.60E-06	1.14E-06	9.13E-07	6.85E-07	6.85E-07	4.57E-07	4.57E-07
24	LA-ann100-sum-500d	1.16E-02	9.97E-03	8.66E-03	7.59E-03	6.71E-03	5.96E-03	5.34E-03	4.80E-03	4.34E-03	1.93E-03	1.08E-03	6.80E-04	4.66E-04	3.38E-04	2.55E-04	2.00E-04	1.60E-04	1.32E-04	1.10E-04
	LA-ann100-sum-500u	6.94E-05	6.07E-05	5.34E-05	4.70E-05	4.20E-05	3.74E-05	3.38E-05	3.06E-05	2.79E-05	1.28E-05	7.31E-06	4.57E-06	3.20E-06	2.28E-06	1.83E-06	1.37E-06	1.37E-06	9.13E-07	9.13E-07
25	LA-ann200-sum-500d	2.32E-02	1.99E-02	1.73E-02	1.52E-02	1.34E-02	1.19E-02	1.07E-02	9.60E-03	8.68E-03	3.86E-03	2.15E-03	1.36E-03	9.32E-04	6.76E-04	5.11E-04	3.99E-04	3.21E-04	2.63E-04	2.20E-04
	LA-ann200-sum-500u	1.39E-04	1.21E-04	1.07E-04	9.41E-05	8.40E-05	7.49E-05	6.76E-05	6.12E-05	5.57E-05	2.56E-05	1.46E-05	9.13E-06	6.39E-06	4.57E-06	3.65E-06	2.74E-06	2.74E-06	1.83E-06	1.83E-06
26	LA-ann500-sum-500d	5.79E-02	4.98E-02	4.33E-02	3.80E-02	3.35E-02	2.98E-02	2.67E-02	2.40E-02	2.17E-02	9.66E-03	5.38E-03	3.40E-03	2.33E-03	1.69E-03	1.28E-03	9.98E-04	8.01E-04	6.58E-04	5.50E-04
	LA-ann500-sum-500u	3.47E-04	3.04E-04	2.67E-04	2.35E-04	2.10E-04	1.87E-04	1.69E-04	1.53E-04	1.39E-04	6.39E-05	3.65E-05	2.28E-05	1.60E-05	1.14E-05	9.13E-06	6.85E-06	6.85E-06	4.57E-06	4.57E-06
27	LA-ann50-sum-1500d	4.56E-03	4.02E-03	3.56E-03	3.18E-03	2.84E-03	2.56E-03	2.31E-03	2.10E-03	1.91E-03	8.85E-04	5.00E-04	3.19E-04	2.19E-04	1.59E-04	1.21E-04	9.45E-05	7.60E-05	6.26E-05	5.23E-05
	LA-ann50-sum-1500u	2.10E-05	1.94E-05	1.80E-05	1.67E-05	1.53E-05	1.42E-05	1.30E-05	1.21E-05	1.12E-05	5.71E-06	3.42E-06	2.28E-06	1.60E-06	1.14E-06	9.13E-07	6.85E-07	6.85E-07	4.57E-07	4.57E-07
28	LA-ann100-sum-1500d	9.11E-03	8.04E-03	7.13E-03	6.35E-03	5.69E-03	5.12E-03	4.62E-03	4.19E-03	3.82E-03	1.77E-03	1.00E-03	6.37E-04	4.38E-04	3.19E-04	2.42E-04	1.89E-04	1.52E-04	1.25E-04	1.05E-04
	LA-ann100-sum-1500u	4.20E-05	3.88E-05	3.61E-05	3.33E-05	3.06E-05	2.83E-05	2.60E-05	2.42E-05	2.24E-05	1.14E-05	6.85E-06	4.57E-06	3.20E-06	2.28E-06	1.83E-06	1.37E-06	1.37E-06	9.13E-07	9.13E-07
29	LA-ann200-sum-1500d	1.82E-02	1.61E-02	1.43E-02	1.27E-02	1.14E-02	1.02E-02	9.24E-03	8.39E-03	7.64E-03	3.54E-03	2.00E-03	1.27E-03	8.77E-04	6.37E-04	4.83E-04	3.78E-04	3.04E-04	2.50E-04	2.09E-04
	LA-ann200-sum-1500u	8.40E-05	7.76E-05	7.21E-05	6.67E-05	6.12E-05	5.66E-05	5.21E-05	4.84E-05	4.47E-05	2.28E-05	1.37E-05	9.13E-06	6.39E-06	4.57E-06	3.65E-06	2.74E-06	2.74E-06	1.83E-06	1.83E-06
30	LA-ann500-sum-1500d	4.56E-02	4.02E-02	3.56E-02	3.18E-02	2.84E-02	2.56E-02	2.31E-02	2.10E-02	1.91E-02	8.85E-03	5.00E-03	3.19E-03	2.19E-03	1.59E-03	1.21E-03	9.45E-04	7.60E-04	6.26E-04	5.23E-04
	LA-ann500-sum-1500u	2.10E-04	1.94E-04	1.80E-04	1.67E-04	1.53E-04	1.42E-04	1.30E-04	1.21E-04	1.12E-04	5.71E-05	3.42E-05	2.28E-05	1.60E-05	1.14E-05	9.13E-06	6.85E-06	6.85E-06	4.57E-06	4.57E-06
31	LA-ann50-bus-500d	7.23E-03	6.33E-03	5.60E-03	4.98E-03	4.47E-03	4.03E-03	3.66E-03	3.33E-03	3.05E-03	1.49E-03	8.83E-04	5.86E-04	4.18E-04	3.15E-04	2.46E-04	1.99E-04	1.65E-04	1.39E-04	1.20E-04
	LA-ann50-bus-500u	1.56E-03	1.38E-03	1.23E-03	1.11E-03	1.00E-03	9.09E-04	8.29E-04	7.59E-04	6.97E-04	3.51E-04	2.13E-04	1.44E-04	1.06E-04	8.16E-05	6.58E-05	5.46E-05	4.63E-05	4.02E-05	3.54E-05
32	LA-ann100-bus-500d	1.45E-02	1.27E-02	1.12E-02	9.97E-03	8.94E-03	8.06E-03	7.31E-03	6.66E-03	6.09E-03	2.98E-03	1.77E-03	1.17E-03	8.37E-04	6.30E-04	4.93E-04	3.98E-04	3.29E-04	2.78E-04	2.39E-04
	LA-ann100-bus-500u	3.11E-03	2.76E-03	2.47E-03	2.22E-03	2.00E-03	1.82E-03	1.66E-03	1.52E-03	1.39E-03	7.02E-04	4.26E-04	2.89E-04	2.11E-04	1.63E-04	1.32E-04	1.09E-04	9.27E-05	8.04E-05	7.08E-05
33	LA-ann200-bus-500d	2.89E-02	2.53E-02	2.24E-02	1.99E-02	1.79E-02	1.61E-02	1.46E-02	1.33E-02	1.22E-02	5.95E-03	3.53E-03	2.34E-03	1.67E-03	1.26E-03	9.86E-04	7.96E-04	6.59E-04	5.57E-04	4.78E-04
	LA-ann200-bus-500u	6.23E-03	5.53E-03	4.94E-03	4.43E-03	4.00E-03	3.64E-03	3.31E-03	3.03E-03	2.79E-03	1.40E-03	8.52E-04	5.78E-04	4.23E-04	3.26E-04	2.63E-04	2.18E-04	1.85E-04	1.61E-04	1.42E-04
34	LA-ann500-bus-500d	7.23E-02	6.33E-02	5.60E-02	4.98E-02	4.47E-02	4.03E-02	3.66E-02	3.33E-02	3.05E-02	1.49E-02	8.83E-03	5.86E-03	4.18E-03	3.15E-03	2.46E-03	1.99E-03	1.65E-03	1.39E-03	1.20E-03
	LA-ann500-bus-500u	1.56E-02	1.38E-02	1.23E-02	1.11E-02	1.00E-02	9.09E-03	8.29E-03	7.59E-03	6.97E-03	3.51E-03	2.13E-03	1.44E-03	1.06E-03	8.16E-04	6.58E-04	5.46E-04	4.63E-04	4.02E-04	3.54E-04
35	LA-ann1000-bus-500d	1.45E-01	1.27E-01	1.12E-01	9.97E-02	8.94E-02	8.06E-02	7.31E-02	6.66E-02	6.09E-02	2.98E-02	1.77E-02	1.17E-02	8.37E-03	6.30E-03	4.93E-03	3.98E-03	3.29E-03	2.78E-03	2.39E-03
	LA-ann1000-bus-500u	3.11E-02	2.76E-02	2.47E-02	2.22E-02	2.00E-02	1.82E-02	1.66E-02	1.52E-02	1.39E-02	7.02E-03	4.26E-03	2.89E-03	2.11E-03	1.63E-03	1.32E-03	1.09E-03	9.27E-04	8.04E-04	7.08E-04
36	LA-ann50-bus-1500d	4.90E-03	4.42E-03	4.01E-03	3.64E-03	3.33E-03	3.05E-03	2.80E-03	2.58E-03	2.39E-03	1.24E-03	7.63E-04	5.17E-04	3.74E-04	2.84E-04	2.24E-04	1.82E-04	1.51E-04	1.28E-04	1.10E-04
	LA-ann50-bus-1500u	8.32E-04	7.80E-04	7.30E-04	6.82E-04	6.38E-04	5.96E-04	5.58E-04	5.22E-04	4.90E-04	2.79E-04	1.79E-04	1.25E-04	9.36E-05	7.34E-05	5.97E-05	4.99E-05	4.27E-05	3.72E-05	3.29E-05
37	LA-ann100-bus-1500d	9.79E-03	8.84E-03	8.02E-03	7.29E-03	6.65E-03	6.09E-03	5.60E-03	5.16E-03	4.77E-03	2.49E-03	1.53E-03	1.03E-03	7.47E-04	5.68E-04	4.48E-04	3.63E-04	3.02E-04	2.56E-04	2.20E-04
	LA-ann100-bus-1500u	1.66E-03	1.56E-03	1.46E-03	1.36E-03	1.28E-03	1.19E-03	1.12E-03	1.04E-03	9.80E-04	5.57E-04	3.58E-04	2.50E-04	1.87E-04	1.47E-04	1.19E-04	9.98E-05	8.54E-05	7.44E-05	6.58E-05
38	LA-ann200-bus-1500d	1.96E-02	1.77E-02	1.60E-02	1.46E-02	1.33E-02	1.22E-02	1.12E-02	1.03E-02	9.55E-03	4.98E-03	3.05E-03	2.07E-03	1.49E-03	1.14E-03	8.95E-04	7.27E-04	6.04E-04	5.12E-04	4.41E-04
	LA-ann200-bus-1500u	3.33E-03	3.12E-03	2.92E-03	2.73E-03	2.55E-03	2.38E-03	2.23E-03	2.09E-03	1.96E-03	1.11E-03	7.15E-04	5.01E-04	3.74E-04	2.94E-04	2.39E-04	2.00E-04	1.71E-04	1.49E-04	1.32E-04
39	LA-ann500-bus-1500d	4.90E-02	4.42E-02	4.01E-02	3.64E-02	3.33E-02	3.05E-02	2.80E-02	2.58E-02	2.39E-02	1.24E-02	7.63E-03	5.17E-03	3.74E-03	2.84E-03	2.24E-03	1.82E-03	1.51E-03	1.28E-03	1.10E-03
	LA-ann500-bus-1500u	8.32E-03	7.80E-03	7.30E-03	6.82E-03	6.38E-03	5.96E-03	5.58E-03	5.22E-03	4.90E-03	2.79E-03	1.79E-03	1.25E-03	9.36E-04	7.34E-04	5.97E-04	4.99E-04	4.27E-04	3.72E-04	3.29E-04
40	LA-ann1000-bus-1500d	9.79E-02	8.84E-02	8.02E-02	7.29E-02	6.65E-02	6.09E-02	5.60E-02	5.16E-02	4.77E-02	2.49E-02	1.53E-02	1.03E-02	7.47E-03	5.68E-03	4.48E-03	3.63E-03	3.02E-03	2.56E-03	2.20E-03
	LA-ann1000-bus-1500u	1.66E-02	1.56E-02	1.46E-02	1.36E-02	1.28E-02	1.19E-02	1.12E-02	1.04E-02	9.80E-03	5.57E-03	3.58E-03	2.50E-03	1.87E-03	1.47E-03	1.19E-03	9.98E-04	8.54E-04	7.44E-04	6.58E-04

Model Run number	Name	1838	1980	2121	2263	2404	2546	2687	2828	3536	4243	4950	5657	6364	7071
1	LA-1H-all-500	2.260	2.050	1.870	1.720	1.590	1.480	1.380	1.290	1.250	0.860	0.770	0.700	0.640	0.600
2	LA-1H-all-1500	1.670	1.540	1.430	1.340	1.250	1.330	1.170	0.950	0.520	0.450	0.860	0.670	0.550	0.620
3	LA-1H-sum-500	0.120	0.100	0.094	0.088	0.079	0.071	0.064	0.059	0.040	0.029	0.025	0.021	0.020	0.018
4	LA-1H-sum-1500	0.120	0.110	0.091	0.083	0.075	0.065	0.066	0.052	0.038	0.029	0.023	0.020	0.019	0.019
5	LA-1H-bus-500	2.190	1.990	1.820	1.690	1.550	1.440	1.360	1.260	0.970	0.820	0.700	0.620	0.550	0.490
6	LA-1H-bus-1500	1.910	1.750	1.600	1.490	1.380	1.290	1.210	1.140	0.910	0.770	0.670	0.590	0.560	0.480
7	LA-24H-all-500	0.302	0.271	0.245	0.225	0.207	0.192	0.178	0.166	0.124	0.097	0.080	0.067	0.058	0.051
8	LA-24H-all-1500	0.269	0.242	0.220	0.201	0.186	0.173	0.161	0.151	0.114	0.090	0.074	0.063	0.054	0.047
9	LA-H-sum-500	0.034	0.030	0.028	0.025	0.023	0.022	0.020	0.019	0.014	0.011	0.009	0.008	0.007	0.006
10	LA-24H-sum-1500	0.030	0.028	0.025	0.023	0.021	0.020	0.019	0.017	0.013	0.010	0.009	0.007	0.006	0.006
11	LA-24H-bus-500	0.175	0.159	0.145	0.133	0.123	0.114	0.107	0.100	0.075	0.060	0.049	0.041	0.036	0.031
12	LA-24H-bus-1500	0.155	0.142	0.130	0.120	0.112	0.104	0.097	0.091	0.069	0.055	0.046	0.039	0.034	0.029
13	LA-ann50-all-500d	1.60E-04	1.42E-04	1.27E-04	1.14E-04	1.04E-04	9.46E-05	8.68E-05	8.00E-05	5.64E-05	4.27E-05	3.38E-05	2.78E-05	2.34E-05	2.01E-05
	LA-ann50-all-500u	1.04E-04	9.30E-05	8.37E-05	7.59E-05	6.92E-05	6.35E-05	5.84E-05	5.41E-05	3.88E-05	2.97E-05	2.37E-05	1.95E-05	1.65E-05	1.42E-05
14	LA-ann100-all-500d	3.21E-04	2.84E-04	2.54E-04	2.29E-04	2.07E-04	1.89E-04	1.74E-04	1.60E-04	1.13E-04	8.54E-05	6.77E-05	5.56E-05	4.68E-05	4.02E-05
	LA-ann100-all-500u	2.08E-04	1.86E-04	1.67E-04	1.52E-04	1.38E-04	1.27E-04	1.17E-04	1.08E-04	7.76E-05	5.94E-05	4.74E-05	3.90E-05	3.30E-05	2.84E-05
15	LA-ann200-all-500d	6.41E-04	5.68E-04	5.08E-04	4.57E-04	4.15E-04	3.78E-04	3.47E-04	3.20E-04	2.26E-04	1.71E-04	1.35E-04	1.11E-04	9.36E-05	8.04E-05
	LA-ann200-all-500u	4.17E-04	3.72E-04	3.35E-04	3.03E-04	2.77E-04	2.54E-04	2.34E-04	2.16E-04	1.55E-04	1.19E-04	9.47E-05	7.81E-05	6.60E-05	5.68E-05
16	LA-ann500-all-500d	1.60E-03	1.42E-03	1.27E-03	1.14E-03	1.04E-03	9.46E-04	8.68E-04	8.00E-04	5.64E-04	4.27E-04	3.38E-04	2.78E-04	2.34E-04	2.01E-04
	LA-ann500-all-500u	1.04E-03	9.30E-04	8.37E-04	7.59E-04	6.92E-04	6.35E-04	5.84E-04	5.41E-04	3.88E-04	2.97E-04	2.37E-04	1.95E-04	1.65E-04	1.42E-04
17	LA-ann1000-all-500d	3.21E-03	2.84E-03	2.54E-03	2.29E-03	2.07E-03	1.89E-03	1.74E-03	1.60E-03	1.13E-03	8.54E-04	6.77E-04	5.56E-04	4.68E-04	4.02E-04
	LA-ann1000-all-500u	2.08E-03	1.86E-03	1.67E-03	1.52E-03	1.38E-03	1.27E-03	1.17E-03	1.08E-03	7.76E-04	5.94E-04	4.74E-04	3.90E-04	3.30E-04	2.84E-04
18	LA-ann50-all-1500d	1.45E-04	1.29E-04	1.16E-04	1.05E-04	9.53E-05	8.71E-05	8.01E-05	7.39E-05	5.25E-05	3.98E-05	3.17E-05	2.61E-05	2.20E-05	1.89E-05
	LA-ann50-all-1500u	9.39E-05	8.42E-05	7.61E-05	6.92E-05	6.34E-05	5.83E-05	5.38E-05	4.99E-05	3.61E-05	2.77E-05	2.23E-05	1.84E-05	1.56E-05	1.34E-05
19	LA-ann100-all-1500d	2.91E-04	2.59E-04	2.32E-04	2.10E-04	1.91E-04	1.74E-04	1.60E-04	1.48E-04	1.05E-04	7.97E-05	6.35E-05	5.22E-05	4.39E-05	3.79E-05
	LA-ann100-all-1500u	1.88E-04	1.68E-04	1.52E-04	1.38E-04	1.27E-04	1.17E-04	1.08E-04	9.99E-05	7.21E-05	5.55E-05	4.45E-05	3.68E-05	3.12E-05	2.68E-05
20	LA-ann200-all-1500d	5.82E-04	5.17E-04	4.64E-04	4.19E-04	3.81E-04	3.48E-04	3.20E-04	2.96E-04	2.10E-04	1.59E-04	1.27E-04	1.04E-04	8.79E-05	7.58E-05
	LA-ann200-all-1500u	3.76E-04	3.37E-04	3.05E-04	2.77E-04	2.53E-04	2.33E-04	2.15E-04	2.00E-04	1.44E-04	1.11E-04	8.90E-05	7.35E-05	6.23E-05	5.37E-05
21	LA-ann500-all-1500d	1.45E-03	1.29E-03	1.16E-03	1.05E-03	9.53E-04	8.71E-04	8.01E-04	7.39E-04	5.25E-04	3.98E-04	3.17E-04	2.61E-04	2.20E-04	1.89E-04
	LA-ann500-all-1500u	9.39E-04	8.42E-04	7.61E-04	6.92E-04	6.34E-04	5.83E-04	5.38E-04	4.99E-04	3.61E-04	2.77E-04	2.23E-04	1.84E-04	1.56E-04	1.34E-04
22	LA-ann1000-all-1500d	2.91E-03	2.59E-03	2.32E-03	2.10E-03	1.91E-03	1.74E-03	1.60E-03	1.48E-03	1.05E-03	7.97E-04	6.35E-04	5.22E-04	4.39E-04	3.79E-04
	LA-ann1000-all-1500u	1.88E-03	1.68E-03	1.52E-03	1.38E-03	1.27E-03	1.17E-03	1.08E-03	9.99E-04	7.21E-04	5.55E-04	4.45E-04	3.68E-04	3.12E-04	2.68E-04
23	LA-ann50-sum-500d	4.68E-05	4.04E-05	3.52E-05	3.11E-05	2.76E-05	2.47E-05	2.24E-05	2.03E-05	1.37E-05	1.00E-05	7.99E-06	6.39E-06	5.48E-06	4.57E-06
	LA-ann50-sum-500u	4.57E-07	2.28E-07	2.28E-07	2.28E-07	2.28E-07	2.28E-07	2.28E-07	2.28E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
24	LA-ann100-sum-500d	9.36E-05	8.08E-05	7.03E-05	6.21E-05	5.53E-05	4.93E-05	4.47E-05	4.06E-05	2.74E-05	2.01E-05	1.60E-05	1.28E-05	1.10E-05	9.13E-06
	LA-ann100-sum-500u	9.13E-07	4.57E-07	4.57E-07	4.57E-07	4.57E-07	4.57E-07	4.57E-07	4.57E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
25	LA-ann200-sum-500d	1.87E-04	1.62E-04	1.41E-04	1.24E-04	1.11E-04	9.86E-05	8.95E-05	8.13E-05	5.48E-05	4.02E-05	3.20E-05	2.56E-05	2.19E-05	1.83E-05
	LA-ann200-sum-500u	1.83E-06	9.13E-07	9.13E-07	9.13E-07	9.13E-07	9.13E-07	9.13E-07	9.13E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
26	LA-ann500-sum-500d	4.68E-04	4.04E-04	3.52E-04	3.11E-04	2.76E-04	2.47E-04	2.24E-04	2.03E-04	1.37E-04	1.00E-04	7.99E-05	6.39E-05	5.48E-05	4.57E-05
	LA-ann500-sum-500u	4.57E-06	2.28E-06	2.28E-06	2.28E-06	2.28E-06	2.28E-06	2.28E-06	2.28E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
27	LA-ann50-sum-1500d	4.45E-05	3.84E-05	3.36E-05	2.95E-05	2.63E-05	2.35E-05	2.12E-05	1.94E-05	1.30E-05	9.59E-06	7.53E-06	6.16E-06	5.25E-06	4.34E-06
	LA-ann50-sum-1500u	4.57E-07	2.28E-07	2.28E-07	2.28E-07	2.28E-07	2.28E-07	2.28E-07	2.28E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
28	LA-ann100-sum-1500d	8.90E-05	7.67E-05	6.71E-05	5.89E-05	5.25E-05	4.70E-05	4.25E-05	3.88E-05	2.60E-05	1.92E-05	1.51E-05	1.23E-05	1.05E-05	8.68E-06
	LA-ann100-sum-1500u	9.13E-07	4.57E-07	4.57E-07	4.57E-07	4.57E-07	4.57E-07	4.57E-07	4.57E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
29	LA-ann200-sum-1500d	1.78E-04	1.53E-04	1.34E-04	1.18E-04	1.05E-04	9.41E-05	8.49E-05	7.76E-05	5.21E-05	3.84E-05	3.01E-05	2.47E-05	2.10E-05	1.74E-05
	LA-ann200-sum-1500u	1.83E-06	9.13E-07	9.13E-07	9.13E-07	9.13E-07	9.13E-07	9.13E-07	9.13E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
30	LA-ann500-sum-1500d	4.45E-04	3.84E-04	3.36E-04	2.95E-04	2.63E-04	2.35E-04	2.12E-04	1.94E-04	1.30E-04	9.59E-05	7.53E-05	6.16E-05	5.25E-05	4.34E-05
	LA-ann500-sum-1500u	4.57E-06	2.28E-06	2.28E-06	2.28E-06	2.28E-06	2.28E-06	2.28E-06	2.28E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
31	LA-ann50-bus-500d	1.04E-04	9.18E-05	8.17E-05	7.34E-05	6.64E-05	6.06E-05	5.56E-05	5.13E-05	3.64E-05	2.79E-05	2.24E-05	1.86E-05	1.59E-05	1.37E-05
	LA-ann50-bus-500u	3.16E-05	2.84E-05	2.59E-05	2.37E-05	2.19E-05	2.03E-05	1.89E-05	1.78E-05	1.35E-05	1.08E-05	9.13E-06	7.88E-06	6.85E-06	6.05E-06
32	LA-ann100-bus-500d	2.08E-04	1.84E-04	1.63E-04	1.47E-04	1.33E-04	1.21E-04	1.11E-04	1.03E-04	7.28E-05	5.57E-05	4.47E-05	3.72E-05	3.17E-05	2.74E-05
	LA-ann100-bus-500u	6.32E-05	5.68E-05	5.18E-05	4.75E-05	4.38E-05	4.06E-05	3.79E-05	3.56E-05	2.69E-05	2.17E-05	1.83E-05	1.58E-05	1.37E-05	1.21E-05
33	LA-ann200-bus-500d	4.16E-04	3.67E-04	3.27E-04	2.94E-04	2.66E-04	2.42E-04	2.22E-04	2.05E-04	1.46E-04	1.11E-04	8.95E-05	7.44E-05	6.35E-05	5.48E-05
	LA-ann200-bus-500u	1.26E-04	1.14E-04	1.04E-04	9.50E-05	8.77E-05	8.13E-05	7.58E-05	7.12E-05	5.39E-05	4.34E-05	3.65E-05	3.15E-05	2.74E-05	2.42E-05
34	LA-ann500-bus-500d	1.04E-03	9.18E-04	8.17E-04	7.34E-04	6.64E-04	6.06E-04	5.56E-04	5.13E-04	3.64E-04	2.79E-04	2.24E-04	1.86E-04	1.59E-04	1.37E-04
	LA-ann500-bus-500u	3.16E-04	2.84E-04	2.59E-04	2.37E-04	2.19E-04	2.03E-04	1.89E-04	1.78E-04	1.35E-04	1.08E-04	9.13E-05	7.88E-05	6.85E-05	6.05E-05
35	LA-ann1000-bus-500d	2.08E-03	1.84E-03	1.63E-03	1.47E-03	1.33E-03	1.21E-03	1.11E-03	1.03E-03	7.28E-04	5.57E-04	4.47E-04	3.72E-04	3.17E-04	2.74E-04
	LA-ann1000-bus-500u	6.32E-04	5.68E-04	5.18E-04	4.75E-04	4.38E-04	4.06E-04	3.79E-04	3.56E-04	2.69E-04	2.17E-04	1.83E-04	1.58E-04	1.37E-04	1.21E-04
36	LA-ann50-bus-1500d	9.61E-05	8.49E-05	7.57E-05	6.82E-05	6.18E-05	5.64E-05	5.17E-05	4.77E-05	3.40E-05	2.60E-05	2.09E-05	1.74E-05	1.48E-05	1.29E-05
	LA-ann50-bus-1500u	2.95E-05	2.66E-05	2.42E-05	2.23E-05	2.05E-05	1.92E-05	1.78E-05	1.68E-05	1.28E-05	1.03E-05	8.68E-06	7.42E-06	6.51E-06	5.82E-06
37	LA-ann100-bus-1500d	1.92E-04	1.70E-04	1.51E-04	1.36E-04	1.24E-04	1.13E-04	1.03E-04	9.54E-05	6.80E-05	5.21E-05	4.18E-05	3.47E-05	2.97E-05	2.58E-05
	LA-ann100-bus-1500u	5.89E-05	5.32E-05	4.84E-05	4.45E-05	4.11E-05	3.84E-05	3.56E-05	3.36E-05	2.56E-05	2.05E-05	1.74E-05	1.48E-05	1.30E-05	1.16E-05
38	LA-ann200-bus-1500d	3.84E-04	3.40E-04	3.03E-04	2.73E-04	2.47E-04	2.26E-04	2.07E-04	1.91E-04	1.36E-04	1.04E-04	8.36E-05	6.94E-05	5.94E-05	5.16E-05
	LA-ann200-bus-1500u	1.18E-04	1.06E-04	9.68E-05	8.90E-05	8.22E-05	7.67E-05	7.12E-05	6.71E-05	5.11E-05	4.11E-05	3.47E-05	2.97E-05	2.60E-05	2.33E-05
39	LA-ann500-bus-1500d	9.61E-04	8.49E-04	7.57E-04	6.82E-04	6.18E-04	5.64E-04	5.17E-04	4.77E-04	3.40E-04	2.60E-04	2.09E-04	1.74E-04	1.48E-04	1.29E-04
	LA-ann500-bus-1500u	2.95E-04	2.66E-04	2.42E-04	2.23E-04	2.05E-04	1.92E-04	1.78E-04	1.68E-04	1.28E-04	1.03E-04	8.68E-05	7.42E-05	6.51E-05	5.82E-05
40	LA-ann1000-bus-1500d	1.92E-03	1.70E-03	1.51E-03	1.36E-03	1.24E-03	1.13E-03	1.03E-03	9.54E-04	6.80E-04	5.21E-04	4.18E-04	3.47E-04	2.97E-04	2.58E-04
	LA-ann1000-bus-1500u	5.89E-04	5.32E-04	4.84E-04	4.45E-04	4.11E-04	3.84E-04	3.56E-04	3.36E-04	2.56E-04	2.05E-04	1.74E-04	1.48E-04	1.30E-04	1.16E-04

Table LA2: Acrolein 1-Hour Hazard Index for Los Angeles

concentrations in micrograms/m^3 Acrolein MRL 0.19 ug/m3

Model Run number	Name	Hours of run time per year	Model outputs	Scenario	Max	Distance Downwind (meters)											
						14	28	42	57	71	85	99	113	127	141	156	170
1	LA-1H-all-500	8760	max 1-hour	all	0.10	0.03	0.10	0.10	0.08	0.07	0.07	0.06	0.05	0.05	0.04	0.04	0.04
2	LA-1H-all-1500	8760	max 1-hour	all	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.00	0.00	0.00	0.00	0.00
3	LA-1H-sum-500	732	max 1-hour	summer	0.07	0.02	0.07	0.07	0.06	0.06	0.03	0.04	0.03	0.03	0.02	0.02	0.02
4	LA-1H-sum-1500	732	max 1-hour	summer	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5	LA-1H-bus-500	4380	max 1-hour	business	0.09	0.03	0.09	0.09	0.09	0.07	0.07	0.06	0.05	0.05	0.04	0.04	0.04
6	LA-1H-bus-1500	4380	max 1-hour	business	0.01	0.00	0.00	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.00	0.00	0.00

Model Run	Name	184	198	212	226	240	255	269	283	424	566	707	849	990	1131	1273	1414
1	LA-1H-all-500	0.04	0.03	0.03	0.03	0.03	0.02	0.02	0.02	0.02	0.02	0.01	0.01	0.01	0.01	0.01	0.01
2	LA-1H-all-1500	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3	LA-1H-sum-500	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4	LA-1H-sum-1500	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5	LA-1H-bus-500	0.04	0.03	0.03	0.03	0.03	0.02	0.02	0.02	0.02	0.01	0.01	0.01	0.01	0.01	0.01	0.00
6	LA-1H-bus-1500	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Model Run	Name	1556	1697	1838	1980	2121	2263	2404	2546	2687	2828	3536	4243	4950	5657	6364	7071
1	LA-1H-all-500	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2	LA-1H-all-1500	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3	LA-1H-sum-500	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4	LA-1H-sum-1500	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5	LA-1H-bus-500	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
6	LA-1H-bus-1500	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Table LA3: 24-Hour PM Concentrations as Percent of CalEPA 24-Hour Standard for Los Angeles

concentrations in micrograms/m^3 50 ug/m3 PM Standard

Model Run number	Name	Engine Size (hp)	Hours of run time per year	Model outputs	Scenario	Max	Distance Downwind (meters)											
							14	28	42	57	71	85	99	113	127	141	156	170
7	LA-24H-all-500	500	8760	24-hour	all	38.58%	3.05%	30.01%	38.58%	36.48%	30.00%	24.14%	20.13%	17.72%	15.55%	13.65%	12.03%	10.64%
8	LA-24H-all-1500	1500	8760	24-hour	all	10.97%	0.00%	1.52%	6.46%	10.29%	10.97%	10.43%	10.20%	9.47%	8.62%	7.83%	7.14%	6.57%
9	LA-H-sum-500	500	732	24-hour	summer	16.14%	1.95%	14.47%	16.14%	13.53%	10.99%	9.37%	7.83%	6.55%	5.50%	4.66%	3.99%	3.44%
10	LA-24H-sum-1500	1500	732	24-hour	summer	4.49%	0.00%	0.86%	2.56%	4.11%	4.49%	4.24%	3.78%	3.30%	2.91%	2.64%	2.44%	2.24%
11	LA-24H-bus-500	500	4380	24-hour	business	28.58%	3.05%	19.61%	28.58%	26.79%	22.83%	18.75%	15.45%	13.11%	11.28%	9.86%	8.72%	7.80%
12	LA-24H-bus-1500	1500	4380	24-hour	business	7.67%	0.00%	1.52%	4.88%	6.06%	7.23%	7.67%	7.33%	6.83%	6.36%	5.83%	5.32%	4.87%

Model Run	Name	184	198	212	226	240	255	269	283	424	566	707	849	990	1131	1273	1414	1556
7	LA-24H-all-500	9.66%	9.05%	8.52%	8.06%	7.64%	7.25%	6.88%	6.55%	4.20%	3.10%	2.35%	1.84%	1.48%	1.23%	1.04%	0.89%	0.77%
8	LA-24H-all-1500	6.09%	5.68%	5.35%	5.06%	4.81%	4.58%	4.37%	4.18%	2.91%	2.15%	1.76%	1.45%	1.21%	1.03%	0.88%	0.77%	0.68%
9	LA-H-sum-500	3.00%	2.63%	2.32%	2.07%	1.85%	1.66%	1.51%	1.37%	0.63%	0.36%	0.26%	0.20%	0.16%	0.13%	0.11%	0.10%	0.08%
10	LA-24H-sum-1500	2.05%	1.88%	1.71%	1.57%	1.44%	1.32%	1.22%	1.12%	0.56%	0.33%	0.22%	0.17%	0.14%	0.12%	0.10%	0.09%	0.08%
11	LA-24H-bus-500	7.04%	6.38%	5.82%	5.33%	4.91%	4.53%	4.20%	3.91%	2.34%	1.68%	1.27%	0.99%	0.80%	0.67%	0.57%	0.50%	0.44%
12	LA-24H-bus-1500	4.47%	4.11%	3.83%	3.59%	3.37%	3.16%	2.98%	2.81%	1.69%	1.16%	0.94%	0.77%	0.65%	0.56%	0.48%	0.43%	0.38%

Model Run	Name	1697	1838	1980	2121	2263	2404	2546	2687	2828	3536	4243	4950	5657	6364	7071
7	LA-24H-all-500	0.68%	0.60%	0.54%	0.49%	0.45%	0.41%	0.38%	0.36%	0.33%	0.25%	0.19%	0.16%	0.13%	0.12%	0.10%
8	LA-24H-all-1500	0.60%	0.54%	0.48%	0.44%	0.40%	0.37%	0.35%	0.32%	0.30%	0.23%	0.18%	0.15%	0.13%	0.11%	0.09%
9	LA-H-sum-500	0.08%	0.07%	0.06%	0.06%	0.05%	0.05%	0.04%	0.04%	0.04%	0.03%	0.02%	0.02%	0.02%	0.01%	0.01%
10	LA-24H-sum-1500	0.07%	0.06%	0.06%	0.05%	0.05%	0.04%	0.04%	0.04%	0.03%	0.03%	0.02%	0.02%	0.01%	0.01%	0.01%
11	LA-24H-bus-500	0.39%	0.35%	0.32%	0.29%	0.27%	0.25%	0.23%	0.21%	0.20%	0.15%	0.12%	0.10%	0.08%	0.07%	0.06%
12	LA-24H-bus-1500	0.34%	0.31%	0.28%	0.26%	0.24%	0.22%	0.21%	0.19%	0.18%	0.14%	0.11%	0.09%	0.08%	0.07%	0.06%

Table LA4: Chronic Cancer Risk from PM for Los Angeles

concentrations in micrograms/m^3

Model Run number	Name	Engine Size (hp)	Hours of run time per year	Model outputs	Scenario	Wind	Max	Distance Downwind (meters)																
								14	28	42	57	71	85	99	113	127	141	156	170	184	198	212	226	240
1	LA-ann50-all-500d	500	50	annual	all	downwind	5.2	0.3	3.6	5.2	5.2	4.5	3.8	3.2	2.8	2.4	2.1	1.9	1.7	1.6	1.4	1.3	1.2	1.1
	LA-ann50-all-500u	500	50	annual	all	upwind	0.8	0.0	0.3	0.6	0.8	0.8	0.8	0.7	0.7	0.7	0.6	0.6	0.6	0.6	0.5	0.5	0.5	0.5
14	LA-ann100-all-500d	500	100	annual	all	downwind	10.4	0.5	7.2	10.4	10.3	9.1	7.7	6.5	5.6	4.8	4.3	3.8	3.4	3.1	2.8	2.6	2.4	2.2
	LA-ann100-all-500u	500	100	annual	all	upwind	1.7	0.0	0.6	1.3	1.6	1.7	1.6	1.5	1.4	1.3	1.2	1.2	1.2	1.1	1.1	1.0	1.0	0.9
15	LA-ann200-all-500d	500	200	annual	all	downwind	20.8	1.0	14.3	20.8	20.6	18.1	15.4	13.0	11.1	9.7	8.5	7.6	6.8	6.2	5.7	5.2	4.8	4.5
	LA-ann200-all-500u	500	200	annual	all	upwind	3.3	0.0	1.2	2.6	3.3	3.3	3.2	2.9	2.8	2.6	2.5	2.4	2.3	2.2	2.1	2.0	2.0	1.9
16	LA-ann500-all-500d	500	500	annual	all	downwind	52.0	2.5	35.8	52.0	51.5	45.3	38.4	32.5	27.8	24.2	21.3	19.0	17.1	15.5	14.2	13.1	12.1	11.2
	LA-ann500-all-500u	500	500	annual	all	upwind	8.4	0.1	3.0	6.5	8.2	8.4	7.9	7.4	6.9	6.6	6.2	6.0	5.8	5.5	5.3	5.1	4.9	4.7
17	LA-ann1000-all-500d	500	1000	annual	all	downwind	104.0	5.0	71.6	104.0	103.1	90.6	76.8	64.9	55.6	48.3	42.6	38.0	34.2	31.1	28.4	26.1	24.2	22.4
	LA-ann1000-all-500u	500	1000	annual	all	upwind	16.7	0.2	5.9	13.0	16.4	16.7	15.8	14.7	13.8	13.1	12.5	12.0	11.5	11.1	10.6	10.2	9.8	9.4
18	LA-ann50-all-1500d	1500	50	annual	all	downwind	1.3	0.0	0.1	0.5	1.0	1.2	1.3	1.3	1.3	1.2	1.1	1.1	1.0	0.9	0.9	0.8	0.8	0.7
	LA-ann50-all-1500u	1500	50	annual	all	upwind	0.2	0.0	0.0	0.0	0.1	0.1	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
19	LA-ann100-all-1500d	1500	100	annual	all	downwind	2.7	0.0	0.1	1.0	1.9	2.5	2.7	2.7	2.6	2.4	2.3	2.1	2.0	1.8	1.7	1.6	1.5	1.4
	LA-ann100-all-1500u	1500	100	annual	all	upwind	0.5	0.0	0.0	0.1	0.1	0.2	0.3	0.4	0.4	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
20	LA-ann200-all-1500d	1500	200	annual	all	downwind	5.3	0.0	0.3	2.0	3.9	5.0	5.3	5.3	5.1	4.8	4.5	4.2	3.9	3.7	3.4	3.2	3.0	2.8
	LA-ann200-all-1500u	1500	200	annual	all	upwind	1.0	0.0	0.0	0.1	0.3	0.5	0.7	0.8	0.8	0.9	0.9	1.0	1.0	1.0	1.0	1.0	1.0	0.9
21	LA-ann500-all-1500d	1500	500	annual	all	downwind	13.4	0.0	0.7	4.9	9.7	12.4	13.4	13.3	12.8	12.1	11.3	10.6	9.8	9.1	8.6	8.0	7.5	7.1
	LA-ann500-all-1500u	1500	500	annual	all	upwind	2.4	0.0	0.0	0.3	0.7	1.2	1.6	1.9	2.1	2.3	2.3	2.4	2.4	2.4	2.4	2.4	2.4	2.4
22	LA-ann1000-all-1500d	1500	1000	annual	all	downwind	26.7	0.0	1.4	9.8	19.4	24.8	26.7	26.6	25.6	24.2	22.6	21.1	19.6	18.3	17.1	16.0	15.1	14.2
	LA-ann1000-all-1500u	1500	1000	annual	all	upwind	4.8	0.0	0.1	0.5	1.5	2.5	3.3	3.8	4.2	4.5	4.7	4.8	4.8	4.8	4.8	4.8	4.8	4.7
23	LA-ann50-sum-500d	500	50	annual	summer	downwind	10.7	0.8	8.6	10.7	9.2	7.2	5.7	4.5	3.6	2.9	2.4	2.0	1.7	1.5	1.3	1.1	1.0	0.9
	LA-ann50-sum-500u	500	50	annual	summer	upwind	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
24	LA-ann100-sum-500d	500	100	annual	summer	downwind	21.3	1.6	17.3	21.3	18.4	14.5	11.3	8.9	7.2	5.9	4.9	4.1	3.5	3.0	2.6	2.3	2.0	1.8
	LA-ann100-sum-500u	500	100	annual	summer	upwind	0.1	0.0	0.0	0.0	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
25	LA-ann200-sum-500d	500	200	annual	summer	downwind	42.7	3.1	34.5	42.7	36.7	29.0	22.6	17.9	14.3	11.7	9.7	8.2	6.9	6.0	5.2	4.6	4.0	3.6
	LA-ann200-sum-500u	500	200	annual	summer	upwind	0.1	0.0	0.0	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
26	LA-ann500-sum-500d	500	500	annual	summer	downwind	106.7	7.8	86.3	106.7	91.8	72.5	56.6	44.7	35.9	29.3	24.3	20.4	17.4	15.0	13.0	11.4	10.1	8.9
	LA-ann500-sum-500u	500	500	annual	summer	upwind	0.3	0.0	0.1	0.2	0.3	0.3	0.3	0.2	0.2	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
27	LA-ann50-sum-1500d	1500	50	annual	summer	downwind	2.9	0.0	0.2	1.4	2.5	2.9	2.8	2.6	2.3	2.0	1.8	1.6	1.4	1.2	1.1	1.0	0.9	0.8
	LA-ann50-sum-1500u	1500	50	annual	summer	upwind	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
28	LA-ann100-sum-1500d	1500	100	annual	summer	downwind	5.7	0.0	0.5	2.8	4.9	5.7	5.6	5.2	4.6	4.1	3.5	3.1	2.7	2.4	2.1	1.9	1.7	1.5
	LA-ann100-sum-1500u	1500	100	annual	summer	upwind	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
29	LA-ann200-sum-1500d	1500	200	annual	summer	downwind	11.4	0.0	1.0	5.6	9.9	11.4	11.3	10.4	9.2	8.1	7.1	6.2	5.5	4.8	4.3	3.8	3.4	3.1
	LA-ann200-sum-1500u	1500	200	annual	summer	upwind	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
30	LA-ann500-sum-1500d	1500	500	annual	summer	downwind	28.6	0.0	2.5	14.1	24.7	28.6	28.2	25.9	23.0	20.3	17.7	15.6	13.7	12.1	10.7	9.5	8.5	7.7
	LA-ann500-sum-1500u	1500	500	annual	summer	upwind	0.1	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.0
31	LA-ann50-bus-500d	500	50	annual	business	downwind	9.5	0.5	6.9	9.5	8.9	7.5	6.1	5.0	4.1	3.4	2.9	2.5	2.2	1.9	1.7	1.5	1.3	1.2
	LA-ann50-bus-500u	500	50	annual	business	upwind	1.2	0.0	0.5	1.0	1.2	1.2	1.1	0.9	0.8	0.7	0.6	0.5	0.5	0.4	0.4	0.3	0.3	0.3
32	LA-ann100-bus-500d	500	100	annual	business	downwind	19.0	1.0	13.8	19.0	17.8	14.9	12.2	9.9	8.2	6.9	5.8	5.0	4.3	3.8	3.4	3.0	2.7	2.4
	LA-ann100-bus-500u	500	100	annual	business	upwind	2.4	0.0	0.9	2.0	2.4	2.4	2.1	1.8	1.6	1.4	1.2	1.1	0.9	0.8	0.7	0.7	0.6	0.5
33	LA-ann200-bus-500d	500	200	annual	business	downwind	38.0	2.0	27.5	38.0	35.6	29.8	24.4	19.9	16.4	13.7	11.6	10.0	8.7	7.6	6.7	6.0	5.4	4.8
	LA-ann200-bus-500u	500	200	annual	business	upwind	4.9	0.0	1.9	4.1	4.9	4.7	4.2	3.7	3.2	2.8	2.4	2.1	1.9	1.7	1.5	1.3	1.2	1.1
34	LA-ann500-bus-500d	500	500	annual	business	downwind	95.0	5.0	68.8	95.0	88.9	74.6	60.9	49.7	41.0	34.3	29.1	25.0	21.7	19.0	16.8	15.0	13.4	12.1
	LA-ann500-bus-500u	500	500	annual	business	upwind	12.2	0.1	4.7	10.2	12.2	11.9	10.6	9.2	8.0	6.9	6.0	5.3	4.7	4.1	3.7	3.3	3.0	2.7
35	LA-ann1000-bus-500d	500	1000	annual	business	downwind	189.9	10.0	137.6	189.9	177.9	149.2	121.8	99.4	82.1	68.7	58.2	50.0	43.4	38.0	33.6	29.9	26.8	24.2
	LA-ann1000-bus-500u	500	1000	annual	business	upwind	24.4	0.2	9.5	20.3	24.4	23.7	21.2	18.5	16.0	13.9	12.1	10.6	9.3	8.3	7.4	6.7	6.0	5.5
36	LA-ann50-bus-1500d	1500	50	annual	business	downwind	2.4	0.0	0.1	1.0	1.9	2.3	2.4	2.4	2.2	2.0	1.8	1.6	1.5	1.3	1.2	1.1	1.0	0.9
	LA-ann50-bus-1500u	1500	50	annual	business	upwind	0.3	0.0	0.0	0.0	0.1	0.2	0.2	0.3	0.3	0.3	0.3	0.3	0.2	0.2	0.2	0.2	0.2	0.2
37	LA-ann100-bus-1500d	1500	100	annual	business	downwind	4.9	0.0	0.3	1.9	3.7	4.7	4.9	4.7	4.4	4.0	3.6	3.3	2.9	2.7	2.4	2.2	2.0	1.8
	LA-ann100-bus-1500u	1500	100	annual	business	upwind	0.6	0.0	0.0	0.1	0.2	0.4	0.5	0.5	0.6	0.6	0.6	0.5	0.5	0.5	0.4	0.4	0.4	0.4
38	LA-ann200-bus-1500d	1500	200	annual	business	downwind	9.7	0.0	0.6	3.8	7.5	9.3	9.7	9.4	8.7	8.0	7.2	6.5	5.9	5.3	4.8	4.4	4.0	3.7
	LA-ann200-bus-1500u	1500	200	annual	business	upwind	1.1	0.0	0.0	0.1	0.5	0.8	1.0	1.1	1.1	1.1	1.1	1.1	1.0	0.9	0.9	0.8	0.8	0.7

Model Run number	Name	255	269	283	424	566	707	849	990	1131	1273	1414	1556	1697	1838	1980	2121	2263	2404	2546	2687	2828	3536	4243	4950	5657	6364	7071
1	LA-ann50-all-500d	1.0	1.0	0.9	0.5	0.3	0.2	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	LA-ann50-all-500u	0.4	0.4	0.4	0.3	0.2	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
14	LA-ann100-all-500d	2.1	1.9	1.8	1.0	0.7	0.5	0.3	0.3	0.2	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	LA-ann100-all-500u	0.9	0.9	0.8	0.5	0.4	0.3	0.2	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
15	LA-ann200-all-500d	4.2	3.9	3.6	2.1	1.3	0.9	0.7	0.5	0.4	0.4	0.3	0.3	0.2	0.2	0.2	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0
	LA-ann200-all-500u	1.8	1.7	1.7	1.1	0.7	0.5	0.4	0.3	0.3	0.2	0.2	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0
16	LA-ann500-all-500d	10.4	9.7	9.1	5.2	3.3	2.3	1.7	1.3	1.1	0.9	0.7	0.6	0.5	0.5	0.4	0.4	0.3	0.3	0.3	0.3	0.2	0.2	0.1	0.1	0.1	0.1	0.1
	LA-ann500-all-500u	4.5	4.3	4.1	2.7	1.9	1.3	1.0	0.8	0.7	0.6	0.5	0.4	0.4	0.3	0.3	0.3	0.2	0.2	0.2	0.2	0.2	0.1	0.1	0.1	0.1	0.0	0.0
17	LA-ann1000-all-500d	20.9	19.5	18.2	10.4	6.7	4.7	3.5	2.7	2.2	1.8	1.5	1.3	1.1	1.0	0.9	0.8	0.7	0.6	0.6	0.5	0.5	0.3	0.3	0.2	0.2	0.1	0.1
	LA-ann1000-all-500u	9.0	8.6	8.3	5.4	3.7	2.7	2.1	1.6	1.3	1.1	0.9	0.8	0.7	0.6	0.6	0.5	0.5	0.4	0.4	0.4	0.3	0.2	0.2	0.1	0.1	0.1	0.1
18	LA-ann50-all-1500d	0.7	0.6	0.6	0.4	0.3	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	LA-ann50-all-1500u	0.2	0.2	0.2	0.2	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
19	LA-ann100-all-1500d	1.3	1.3	1.2	0.8	0.5	0.4	0.3	0.2	0.2	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	LA-ann100-all-1500u	0.5	0.5	0.5	0.4	0.3	0.2	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
20	LA-ann200-all-1500d	2.7	2.5	2.4	1.5	1.1	0.8	0.6	0.5	0.4	0.3	0.3	0.2	0.2	0.2	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0
	LA-ann200-all-1500u	0.9	0.9	0.9	0.7	0.5	0.4	0.3	0.3	0.2	0.2	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0
21	LA-ann500-all-1500d	6.7	6.4	6.0	3.8	2.6	1.9	1.5	1.2	0.9	0.8	0.7	0.6	0.5	0.4	0.4	0.3	0.3	0.3	0.3	0.2	0.2	0.2	0.1	0.1	0.1	0.1	0.1
	LA-ann500-all-1500u	2.3	2.3	2.3	1.8	1.4	1.1	0.8	0.7	0.6	0.5	0.4	0.4	0.3	0.3	0.3	0.2	0.2	0.2	0.2	0.2	0.1	0.1	0.1	0.1	0.1	0.0	0.0
22	LA-ann1000-all-1500d	13.4	12.7	12.1	7.6	5.3	3.8	2.9	2.3	1.9	1.6	1.3	1.1	1.0	0.9	0.8	0.7	0.6	0.6	0.5	0.5	0.4	0.3	0.2	0.2	0.2	0.1	0.1
	LA-ann1000-all-1500u	4.6	4.6	4.5	3.6	2.7	2.1	1.7	1.4	1.1	1.0	0.8	0.7	0.6	0.6	0.5	0.5	0.4	0.4	0.3	0.3	0.3	0.2	0.2	0.1	0.1	0.1	0.1
23	LA-ann50-sum-500d	0.8	0.7	0.7	0.3	0.2	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	LA-ann50-sum-500u	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
24	LA-ann100-sum-500d	1.6	1.4	1.3	0.6	0.3	0.2	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	LA-ann100-sum-500u	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
25	LA-ann200-sum-500d	3.2	2.9	2.6	1.2	0.6	0.4	0.3	0.2	0.2	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	LA-ann200-sum-500u	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
26	LA-ann500-sum-500d	8.0	7.2	6.5	2.9	1.6	1.0	0.7	0.5	0.4	0.3	0.2	0.2	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0
	LA-ann500-sum-500u	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
27	LA-ann50-sum-1500d	0.7	0.6	0.6	0.3	0.2	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	LA-ann50-sum-1500u	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
28	LA-ann100-sum-1500d	1.4	1.3	1.1	0.5	0.3	0.2	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	LA-ann100-sum-1500u	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
29	LA-ann200-sum-1500d	2.8	2.5	2.3	1.1	0.6	0.4	0.3	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	LA-ann200-sum-1500u	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
30	LA-ann500-sum-1500d	6.9	6.3	5.7	2.7	1.5	1.0	0.7	0.5	0.4	0.3	0.2	0.2	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0
	LA-ann500-sum-1500u	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
31	LA-ann50-bus-500d	1.1	1.0	0.9	0.4	0.3	0.2	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	LA-ann50-bus-500u	0.2	0.2	0.2	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
32	LA-ann100-bus-500d	2.2	2.0	1.8	0.9	0.5	0.4	0.3	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	LA-ann100-bus-500u	0.5	0.5	0.4	0.2	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
33	LA-ann200-bus-500d	4.4	4.0	3.7	1.8	1.1	0.7	0.5	0.4	0.3	0.2	0.2	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0
	LA-ann200-bus-500u	1.0	0.9	0.8	0.4	0.3	0.2	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
34	LA-ann500-bus-500d	11.0	10.0	9.1	4.5	2.6	1.8	1.3	0.9	0.7	0.6	0.5	0.4	0.4	0.3	0.3	0.2	0.2	0.2	0.2	0.2	0.2	0.1	0.1	0.1	0.1	0.0	0.0
	LA-ann500-bus-500u	2.5	2.3	2.1	1.1	0.6	0.4	0.3	0.2	0.2	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0
35	LA-ann1000-bus-500d	21.9	20.0	18.3	8.9	5.3	3.5	2.5	1.9	1.5	1.2	1.0	0.8	0.7	0.6	0.6	0.5	0.4	0.4	0.4	0.3	0.3	0.2	0.2	0.1	0.1	0.1	0.1
	LA-ann1000-bus-500u	5.0	4.6	4.2	2.1	1.3	0.9	0.6	0.5	0.4	0.3	0.3	0.2	0.2	0.2	0.2	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.0
36	LA-ann50-bus-1500d	0.8	0.8	0.7	0.4	0.2	0.2	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	LA-ann50-bus-1500u	0.2	0.2	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
37	LA-ann100-bus-1500d	1.7	1.5	1.4	0.7	0.5	0.3	0.2	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	LA-ann100-bus-1500u	0.3	0.3	0.3	0.2	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
38	LA-ann200-bus-1500d	3.4	3.1	2.9	1.5	0.9	0.6	0.4	0.3	0.3	0.2	0.2	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0
	LA-ann200-bus-1500u	0.7	0.6	0.6	0.3	0.2	0.2	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Table SAC1: Model Results for Sacramento

concentrations in micrograms/m^3

Model Run number	Name	Engine Size (hp)	PM Emissions (lb/hr)	Hours of run time per year	Model outputs	Scenario	Wind	Max	Distance Downwind (meters)																					
									14	28	42	57	71	85	99	113	127	141	156	170	184	198	212	226	240	255	269	283	424	566
1	Sac-1H-all-500	500	1.1	8760	max 1-hour	all		66.73	38.436	66.731	63.653	56.280	48.545	52.396	53.492	51.666	48.492	44.938	41.503	38.390	35.645	33.245	31.144	29.297	27.661	26.204	24.898	23.720	16.225	12.800
2	Sac-1H-all-1500	1500	1.05	8760	max 1-hour	all		23.06	0.452	18.133	23.062	22.852	20.585	18.083	16.182	14.735	13.263	12.023	11.189	10.469	9.728	9.044	8.503	8.157	8.493	8.731	8.881	8.956	8.057	7.804
3	Sac-1H-sum-500	500	1.1	732	max 1-hour	summer		66.73	29.584	66.731	63.493	56.280	48.460	42.859	36.773	31.942	29.777	27.285	24.871	22.600	20.505	18.613	16.921	15.418	14.085	12.903	11.855	10.922	6.068	4.537
4	Sac-1H-sum-1500	1500	1.05	732	max 1-hour	summer		22.85	0.177	13.872	21.297	22.852	20.585	17.994	16.182	14.735	13.263	12.008	11.136	10.427	9.693	8.975	8.295	7.664	7.086	6.766	6.536	6.292	4.103	3.095
5	Sac-1H-bus-500	500	1.1	4380	max 1-hour	business		66.73	38.436	66.731	63.653	56.280	48.545	52.396	53.492	51.666	48.492	44.938	41.503	38.390	35.645	33.245	31.144	29.297	27.661	26.204	24.898	23.720	16.225	12.453
6	Sac-1H-sum-1500	1500	1.05	4380	max 1-hour	business		23.06	0.452	18.133	23.062	22.852	20.585	18.083	16.182	14.735	13.263	12.023	11.189	10.469	9.728	9.044	8.503	8.157	8.493	8.731	8.881	8.956	7.700	6.688
7	Sac-24H-all-500	500	1.1	8760	24-hour	all		31.79	4.036	30.164	31.788	27.884	24.279	20.123	16.665	14.493	12.963	11.516	10.215	9.073	8.108	7.472	6.914	6.420	5.980	5.586	5.231	4.910	2.858	2.094
8	Sac-24H-all-1500	1500	1.05	8760	24-hour	all		9.91	0.027	2.078	7.250	9.904	9.906	8.876	7.871	7.151	6.643	6.071	5.505	4.979	4.502	4.118	3.787	3.488	3.351	3.230	3.111	2.995	2.047	1.459
9	Sac-24H-sum-500	500	1.1	732	24-hour	summer		18.44	2.086	13.561	18.444	15.848	12.432	9.699	7.670	6.173	5.055	4.207	3.551	3.036	2.624	2.290	2.017	1.789	1.599	1.437	1.300	1.181	0.614	0.397
10	Sac-24H-sum-1500	1500	1.05	732	24-hour	summer		5.32	0.012	1.043	3.115	4.554	5.315	5.194	4.724	4.172	3.647	3.183	2.787	2.453	2.170	1.930	1.725	1.550	1.400	1.269	1.156	1.058	0.513	0.316
11	Sac-24H-bus-500	500	1.1	4380	24-hour	business		27.19	3.660	21.693	27.188	23.362	18.321	14.283	11.851	10.753	9.611	8.540	7.579	6.738	6.007	5.377	4.832	4.360	3.951	3.594	3.282	3.060	1.779	1.163
12	Sac-24H-sum-1500	1500	1.05	4380	24-hour	business		7.59	0.027	1.836	5.503	7.000	7.593	7.489	6.846	6.064	5.310	4.637	4.062	3.575	3.161	2.809	2.625	2.505	2.382	2.259	2.140	2.025	1.322	0.929
13	Sac-ann-50-all-500d	500	1.1	50	annual	all	downwind	0.03	1.45E-03	2.30E-02	3.24E-02	2.97E-02	2.45E-02	1.98E-02	1.62E-02	1.34E-02	1.14E-02	9.80E-03	8.58E-03	7.60E-03	6.81E-03	6.15E-03	5.59E-03	5.12E-03	4.71E-03	4.35E-03	4.03E-03	3.74E-03	2.05E-03	1.30E-03
	Sac-ann-50-all-500u	500	1.1	50	annual	all	upwind	0.00	7.99E-06	3.05E-04	7.45E-04	1.03E-03	1.10E-03	1.06E-03	9.81E-04	9.00E-04	8.26E-04	7.59E-04	7.01E-04	6.49E-04	6.03E-04	5.62E-04	5.26E-04	4.93E-04	4.63E-04	4.36E-04	4.12E-04	3.89E-04	2.35E-04	1.57E-04
14	Sac-ann-100-all-500d	500	1.1	100	annual	all	downwind	0.06	2.91E-03	4.60E-02	6.47E-02	5.95E-02	4.90E-02	3.97E-02	3.24E-02	2.69E-02	2.27E-02	1.96E-02	1.72E-02	1.52E-02	1.36E-02	1.23E-02	1.12E-02	1.02E-02	9.41E-03	8.69E-03	8.05E-03	7.49E-03	4.10E-03	2.60E-03
	Sac-ann-100-all-500u	500	1.1	100	annual	all	upwind	0.00	1.60E-05	6.11E-04	1.49E-03	2.06E-03	2.21E-03	2.12E-03	1.96E-03	1.80E-03	1.65E-03	1.52E-03	1.40E-03	1.30E-03	1.21E-03	1.12E-03	1.05E-03	9.86E-04	9.27E-04	8.73E-04	8.23E-04	7.78E-04	4.71E-04	3.13E-04
15	Sac-ann-200-all-500d	500	1.1	200	annual	all	downwind	0.13	5.82E-03	9.19E-02	1.29E-01	1.19E-01	9.81E-02	7.94E-02	6.47E-02	5.37E-02	4.55E-02	3.92E-02	3.43E-02	3.04E-02	2.72E-02	2.46E-02	2.24E-02	2.05E-02	1.88E-02	1.74E-02	1.61E-02	1.50E-02	8.20E-03	5.20E-03
	Sac-ann-200-all-500u	500	1.1	200	annual	all	upwind	0.00	3.20E-05	1.22E-03	2.98E-03	4.11E-03	4.41E-03	4.24E-03	3.93E-03	3.60E-03	3.30E-03	3.04E-03	2.80E-03	2.60E-03	2.41E-03	2.25E-03	2.10E-03	1.97E-03	1.85E-03	1.75E-03	1.65E-03	1.56E-03	9.42E-04	6.27E-04
16	Sac-ann-500-all-500d	500	1.1	500	annual	all	downwind	0.32	1.45E-02	2.30E-01	3.24E-01	2.97E-01	2.45E-01	1.98E-01	1.62E-01	1.34E-01	1.14E-01	9.80E-02	8.58E-02	7.60E-02	6.81E-02	6.15E-02	5.59E-02	5.12E-02	4.71E-02	4.35E-02	4.03E-02	3.74E-02	2.05E-02	1.30E-02
	Sac-ann-500-all-500u	500	1.1	500	annual	all	upwind	0.01	7.99E-05	3.05E-03	7.45E-03	1.03E-02	1.10E-02	1.06E-02	9.81E-03	9.00E-03	8.26E-03	7.59E-03	7.01E-03	6.49E-03	6.03E-03	5.62E-03	5.26E-03	4.93E-03	4.63E-03	4.36E-03	4.12E-03	3.89E-03	2.35E-03	1.57E-03
17	Sac-ann-1000-all-500d	500	1.1	1000	annual	all	downwind	0.65	2.91E-02	4.60E-01	6.47E-01	5.95E-01	4.90E-01	3.97E-01	3.24E-01	2.69E-01	2.27E-01	1.96E-01	1.72E-01	1.52E-01	1.36E-01	1.23E-01	1.12E-01	1.02E-01	9.41E-02	8.69E-02	8.05E-02	7.49E-02	4.10E-02	2.60E-02
	Sac-ann-1000-all-500u	500	1.1	1000	annual	all	upwind	0.02	1.60E-04	6.11E-03	1.49E-02	2.06E-02	2.21E-02	2.12E-02	1.96E-02	1.80E-02	1.65E-02	1.52E-02	1.40E-02	1.30E-02	1.21E-02	1.12E-02	1.05E-02	9.86E-03	9.27E-03	8.73E-03	8.23E-03	7.78E-03	4.71E-03	3.13E-03
18	Sac-ann-50-all-1500d	1500	1.05	50	annual	all	downwind	0.01	4.57E-07	5.00E-04	3.41E-03	6.66E-03	8.24E-03	8.51E-03	8.13E-03	7.49E-03	6.80E-03	6.14E-03	5.55E-03	5.04E-03	4.59E-03	4.21E-03	3.87E-03	3.58E-03	3.33E-03	3.10E-03	2.90E-03	2.72E-03	1.60E-03	1.07E-03
	Sac-ann-50-all-1500u	1500	1.05	50	annual	all	upwind	0.00	0.00E+00	1.43E-06	2.05E-05	6.69E-05	1.23E-04	1.75E-04	2.16E-04	2.45E-04	2.64E-04	2.74E-04	2.78E-04	2.75E-04	2.71E-04	2.65E-04	2.58E-04	2.51E-04	2.44E-04	2.37E-04	2.30E-04	2.22E-04	1.60E-04	1.17E-04
19	Sac-ann-100-all-1500d	1500	1.05	100	annual	all	downwind	0.02	9.13E-07	1.00E-03	6.82E-03	1.33E-02	1.65E-02	1.70E-02	1.63E-02	1.50E-02	1.36E-02	1.23E-02	1.11E-02	1.01E-02	9.19E-03	8.42E-03	7.75E-03	7.17E-03	6.66E-03	6.20E-03	5.80E-03	5.44E-03	3.20E-03	2.13E-03
	Sac-ann-100-all-1500u	1500	1.05	100	annual	all	upwind	0.00	0.00E+00	2.85E-06	4.11E-05	1.34E-04	2.46E-04	3.50E-04	4.33E-04	4.91E-04	5.28E-04	5.48E-04	5.55E-04	5.51E-04	5.41E-04	5.30E-04	5.16E-04	5.02E-04	4.88E-04	4.74E-04	4.59E-04	4.45E-04	3.21E-04	2.35E-04
20	Sac-ann-200-all-1500d	1500	1.05	200	annual	all	downwind	0.03	1.83E-06	2.00E-03	1.36E-02	2.66E-02	3.30E-02	3.41E-02	3.25E-02	2.99E-02	2.72E-02	2.46E-02	2.22E-02	2.02E-02	1.84E-02	1.68E-02	1.55E-02	1.43E-02	1.33E-02	1.24E-02	1.16E-02	1.09E-02	6.40E-03	4.26E-03
	Sac-ann-200-all-1500u	1500	1.05	200	annual	all	upwind	0.00	0.00E+00	5.71E-06	8.22E-05	2.68E-04	4.92E-04	7.01E-04	8.66E-04	9.82E-04	1.06E-03	1.10E-03	1.11E-03	1.10E-03	1.08E-03	1.06E-03	1.03E-03	1.00E-03	9.76E-04	9.47E-04	9.18E-04	8.90E-04	6.42E-04	4.70E-04
21	Sac-ann-500-all-1500d	1500	1.05	500	annual	all	downwind	0.09	4.57E-06	5.00E-03	3.41E-02	6.66E-02	8.24E-02	8.51E-02	8.13E-02	7.49E-02	6.80E-02	6.14E-02	5.55E-02	5.04E-02	4.59E-02	4.21E-02	3.87E-02	3.58E-02	3.33E-02	3.10E-02	2.90E-02	2.72E-02	1.60E-02	1.07E-02
	Sac-ann-500-all-1500u	1500	1.05	500	annual	all	upwind	0.00	0.00E+00	1.43E-05	2.05E-04	6.69E-04	1.23E-03	1.75E-03	2.16E-03	2.45E-03	2.64E-03	2.74E-03	2.78E-03	2.75E-03	2.71E-03	2.65E-03	2.58E-03	2.51E-03	2.44E-03	2.37E-03	2.30E-03	2.22E-03	1.60E-03	1.17E-03
22	Sac-ann-1000-all-1500d	1500	1.05	1000	annual	all	downwind	0.17	9.13E-06	1.00E-02	6.82E-02	1.33E-01	1.65E-01	1.70E-01	1.63E-01	1.50E-01	1.36E-01	1.23E-01	1.11E-01	1.01E-01	9.19E-02	8.42E-02	7.75E-02	7.17E-02	6.66E-02	6.20E-02	5.80E-02	5.44E-02	3.20E-02	2.13E-02
	Sac-ann-1000-all-1500u	1500	1.05	1000	annual	all	upwind	0.01	0.00E+00	2.85E-05	4.11E-04	1.34E-03	2.46E-03	3.50E-03	4.33E-03	4.91E-03	5.28E-03	5.48E-03	5.55E-03	5.51E-03	5.41E-03	5.30E-03	5.16E-03	5.02E-03	4.88E-03	4.74E-03	4.59E-03	4.45E-03	3.21E-03	2.35E-03
23	SAC-ann50-sum-500d	500	1.1	50	annual	summer	downwind	0.11	7.05E-03	8.81E-02	1.10E-01	9.32E-02	7.31E-02	5.70E-02	4.50E-02	3.62E-02	2.96E-02	2.46E-02	2.07E-02	1.76E-02	1.52E-02	1.32E-02	1.16E-02	1.03E-02	9.16E-03	8.21E-03	7.40E-03	6.70E-03	3.05E-03	1.74E-03
	SAC-ann50-sum-500u	500	1.1	50	annual	summer	upwind	0.00	2.03E-05	3.38E-04	5.92E-04	6.91E-04	6.71E-04	6.01E-04	5.22E-04	4.50E-04	3.88E-04	3.35E-04	2.91E-04	2.54E-04	2.23E-04	1.97E-04	1.75E-04	1.56E-04	1.40E-04	1.26E-04	1.15E-04	1.04E-04	4.82E-05	2.76E-05
24	SAC-ann100-sum-500d	500	1.1	100	annual	summer	downwind	0.22	1.41E-02	1.76E-01	2.19E-01	1.86E-01	1.46E-01	1.14E-01	9.01E-02	7.24E-02	5.92E-02	4.91E-02	4.14E-02	3.53E-02	3.04E-02	2.65E-02	2.32E-02	2.06E-02	1.83E-02	1.64E-02	1.48E-02	1.34E-02	6.10E-03	3.47E-03
	SAC-ann100-sum-500u	500	1.1	100	annual	summer	upwind	0.00	4.06E-05	6.76E-04	1.18E-03	1.38E-03	1.34E-03	1.20E-03	1.04E-03	9.01E-04	7.76E-04	6.70E-04	5.82E-04	5.08E-04	4.46E-04	3.94E-04	3.50E-04	3.13E-04	2.81E-04	2.53E-04	2.29E-04	2.09E-04	9.63E-05	5.53E-05
25	SAC-ann200-sum-500d	500	1.1	200	annual	summer	downwind	0.44	2.82E-02	3.52E-01	4.39E-01	3.73E-01	2.92E-01	2.28E-01	1.80E-01	1.45E-01	1.18E-01	9.82E-02	8.27E-02	7.05E-02	6.08E-02	5.29E-02	4.65E-02	4.11E-02	3.66E-02	3.28E-02	2.96E-02	2.68E-02	1.22E-02	6.95E-03
	SAC-ann200-sum-500u	500	1.1	200	annual	summer	upwind	0.00	8.13E-05	1.35E-03	2.37E-03	2.76E-03	2.68E-03	2.40E-03	2.09E-03	1.80E-03	1.55E-03	1.34E-03	1.16E-03	1.02E-03	8.92E-04	7.88E-04	7.00E-04	6.26E-04	5.62E-04	5.06E-04	4.58E-04	4.17E-04	1.93E-04	1.11E-04
26	SAC-ann500-sum-500d	500	1.1	500	annual	summer	downwind	1.10	7.05E-02	8.81E-01	1.10E+00	9.32E-01	7.31E-01	5.70E-01	4.50E-01	3.62E-01	2.96E-01	2.46E-01	2.07E-01	1.76E-01	1.52E-01	1.32E-01	1.16E-01	1.03E-01	9.16E-02	8.21E-02	7.40E-02	6.70E-02	3.05E-02	1.74E-02
	SAC-ann500-sum-500u	500	1.1	500	annual	summer	upwind	0.01	2.03E-04	3.38E-03	5.92E-03	6.91E-03	6.71E-03	6.01E-03	5.22E-03	4.50E-03	3.88E-03	3.35E-03	2.91E-03	2.54E-03	2.23E-03	1.97E-03	1.75E-03	1.56E-03	1.40E-03	1.26E-03	1.15E-03	1.04E-03	4.82E-04	2.76E-04
28	SAC-ann50-sum-1500d	1500	1.05	50	annual	summer	downwind	0.03	2.05E-06	2.46E-03	1.45E-02	2.57E-02	2.96E-02	2.90E-02	2.65E-02	2.35E-02	2.06E-02	1.80E-02	1.58E-02	1.39E-02	1.23E-02	1.09E-02	9.77E-03	8.77E-03	7.90E-03	7.16E-03	6.51E-03	5.94E-03	2.81E-03	1.62E-03
	SAC-ann50-sum-1500u	1500	1.05	50	annual	summer	upwind	0.00	0.00E+00	3.88E-06	3.52E-05	7.65E-05	1.11E-04	1.36E-04	1.51E-04	1.57E-04	1.57E-04	1.52E-04	1.45E-04	1.36E-04	1.27E-04	1.18E-04	1.10E-04	1.02E-04	9.52E-05	8.84E-05	8.22E-05	7.65E-05	4.04E-05	2.42E-05
29	SAC-ann100-sum-1500d	1500	1.05	100	annual	summer	downwind	0.06	4.11E-06	4.92E-03	2.91E-02	5.14E-02	5.92E-02	5.79E-02	5.29E-02	4.70E-02	4.12E-02	3.61E-02	3.16E-02	2.79E-02	2.46E-02	2.19E-02	1.95E-02	1.75E-02	1.58E-02	1.43E-02	1.30E-02	1.19E-02	5.62E-03	3.25E-03
	SAC-ann100-sum-1500u	1500	1.05	100	annual	summer	upwind	0.00	0.00E+00	7.76E-06	7.03E-05	1.53E-04	2.22E-04	2.72E-04	3.02E-04	3.14E-04	3.13E-04	3.04E-04	2.89E-04	2.72E-04	2.54E-04	2.37E-04	2.20E-04	2.05E-04	1.90E-04	1.77E-04	1.64E-04	1.53E-04	8.08E-05	4.84E-05
30	SAC-ann200-sum-1500d	1500	1.05	200	annual	summer	downwind	0.12	8.22E-06	9.85E-03	5.82E-02	1.03E-01	1.18E-01	1.16E-01	1.06E-01	9.40E-02	8.25E-02	7.22E-02	6.33E-02	5.57E-02	4.93E-02	4.38E-02	3.91E-02	3.51E-02	3.16E-02	2.86E-02	2.60E-02	2.37E-02	1.12E-02	6.50E-03
	SAC-ann200-sum-1500u	1500	1.05	200	annual	summer	upwind	0.00	0.00E+00	1.55E-05	1.41E-04	3.06E-04	4.45E-04	5.44E-04	6.04E-04	6.28E-04	6.26E-04	6.08E-04	5.79E-04	5.44E-04	5.09E-04	4.74E-04	4.40E-04	4.09E-04	3.81E-04	3.53E-04	3.29E-04	3.06E-04	1.62E-04	9.68E-05
31	SAC-ann500-sum-1500d	1500	1.05	500	annual	summer	downwind	0.30	2.05E-05	2.46E-02	1.45E-01	2.57E-01	2.96E-01	2.90E-01	2.65E-01	2.35E-01	2.06E-01	1.80E-01	1.58E-01	1.39E-01	1.23E-01	1.09E-01	9.77E-02	8.77E-02	7.90E-02	7.16E-02	6.51E-02	5.94E-02	2.81E-02	1.62E-02
	SAC-ann500-sum-1500u	1500	1.05	500	annual	summer	upwind	0.00	0.00E+00	3.88E-05	3.52E-04	7.65E-04	1.11E-03	1.36E-03	1.51E-03	1.57E-03	1.57E-03	1.52E-03	1.45E-03	1.36E-03	1.27E-03	1.18E-03	1.10E-03	1.02E-03	9.52E-04	8.84E-04	8.22E-04	7.65E-04	4.04E-04	2.42E-04
33	SAC-ann50-bus-500d	500	1.1	50	annual	business	downwind	0.06	2.79E-03	4.04E-02	5.50E-02	4.98E-02	4.07E-02	3.26E-02	2.63E-02	2.15E-02	1.78E-02	1.50E-02	1.28E-02	1.10E-02	9.58E-03	8.41E-03	7.45E-03	6.64E-03	5.95E-03	5.37E-03	4.87E-03	4.44E-03	2.11E-03	1.23E-03
	SAC-ann50-bus-500u	500	1.1	50	annual	business	upwind	0.00	1.58E-05	5.87E-04	1.38E-03	1.82E-03	1.89E-03	1.76E-03	1.57E-03	1.38E-03	1.22E-03	1.07E-03	9.51E-04	8.47E-04	7.58E-04	6.82E-04	6.16E-04	5.60E-04	5.11E-04	4.68E-04	4.31E-04	3.98E-04	2.07E-04	1.27E-04
34	SAC-ann100-bus-500d	500	1.1	100	annual	business	downwind	0.11	5.58E-03	8.08E-02	1.10E-01	9.95E-02	8.14E-02	6.53E-02	5.27E-02	4.30E-02	3.57E-02	3.00E-02	2.56E-02	2.20E-02	1.92E-02	1.68E-02	1.49E-02	1.33E-02	1.19E-02	1.07E-02	9.74E-03	8.88E-03	4.21E-03	2.46E-03
	SAC-ann100-bus-500u	500	1.1	100	annual	business	upwind	0.00	3.15E-05	1.17E-03	2.76E-03	3.65E-03	3.77E-03	3.51E-03	3.14E-03	2.77E-03	2.43E-03	2.15E-03	1.90E-03	1.69E-03	1.52E-03	1.36E-03	1.23E-03	1.12E-03	1.02E-03	9.37E-04	8.62E-04	7.96E-04	4.13E-04	2.55E-04
35	SAC-ann200-bus-500d	500	1.1	200	annual	business	downwind	0.22	1.12E-02	1.62E-01	2.20E-01	1.99E-01	1.63E-01	1.31E-01	1.05E-01	8.61E-02	7.14E-02	6.00E-02	5.11E-02	4.40E-02	3.83E-02	3.36E-02	2.98E-02	2.65E-02	2.38E-02	2.15E-02	1.95E-02	1.78E-02	8.42E-03	4.93E-03
	SAC-ann200-bus-500u	500	1.1	200	annual	business	upwind	0.01	6.30E-05	2.35E-03	5.52E-03	7.30E-03	7.55E-03	7.03E-03	6.27E-03	5.53E-03	4.87E-03	4.29E-03	3.80E-03	3.39E-03	3.03E-03	2.73E-03	2.47E-03	2.24E-03	2.04E-03	1.87E-03	1.72E-03	1.59E-03	8.27E-04	5.10E-04
36	SAC-ann500-bus-500d	500	1.1	500	annual	business	downwind	0.55	2.79E-02	4.04E-01	5.50E-01	4.98E-01	4.07E-01	3.26E-01	2.63E-01	2.15E-01	1.78E-01	1.50E-01	1.28E-01	1.10E-01	9.58E-02	8.41E-02	7.45E-02	6.64E-02	5.95E-02	5.37E-02	4.87E-02	4.44E-02	2.11E-02	1.23E-02
	SAC-ann500-bus-500u	500	1.1	500	annual	business	upwind	0.02	1.58E-04	5.87E-03	1.38E-02	1.82E-02	1.89E-02	1.76E-02	1.57E-02	1.38E-02	1.22E-02	1.07E-02	9.51E-03	8.47E-03	7.58E-03	6.82E-03	6.16E-03	5.60E-03	5.11E-03	4.68E-03	4.31E-03	3.98E-03	2.07E-03	1.27E-03
37	SAC-ann1000-bus-500d	500	1.1	1000	annual	business	downwind	1.10	5.58E-02	8.08E-01	1.10E+00	9.95E-01	8.14E-01	6.53E-01	5.27E-01	4.30E-01	3.57E-01	3.00E-01	2.56E-01	2.20E-01	1.92E-01	1.68E-01	1.49E-01	1.33E-01	1.19E-01	1.07E-01	9.74E-02	8.88E-02	4.21E-02	2.46E-02
	SAC-ann1000-bus-500u	500	1.1	1000	annual	business	upwind	0.04	3.15E-04	1.17E-02	2.76E-02	3.65E-02	3.77E-02	3.51E-02	3.14E-02	2.77E-02	2.43E-02	2.15E-02	1.90E-02	1.69E-02	1.52E-02	1.36E-02	1.23E-02	1.12E-02	1.02E-02	9.37E-03	8.62E-03	7.96E-03	4.13E-03	2.55E-03
38	SAC-ann50-bus-1500d	1500	1.05	50	annual	business	downwind	0.01	9.13E-07	9.47E-04	6.10E-03	1.15E-02	1.40E-02	1.44E-02	1.36E-02	1.24E-02	1.11E-02	9.95E-03	8.87E-03	7.93E-03	7.11E-03	6.39E-03	5.78E-03	5.24E-03	4.77E-03	4.36E-03	3.99E-03	3.67E-03	1.84E-03	1.11E-03
	SAC-ann50-bus-1500u	1500	1.05	50	annual	business	upwind	0.00	0.00E+00	2.85E-06	4.02E-05	1.29E-04	2.32E-04	3.20E-04	3.82E-04	4.18E-04	4.34E-04	4.34E-04	4.25E-04	4.09E-04	3.89E-04	3.69E-04	3.49E-04	3.30E-04	3.12E-04	2.94E-04	2.78E-04	2.62E-04	1.57E-04	1.03E-04
39	SAC-ann100-bus-1500d	1500	1.05	100	annual	business	downwind	0.03	1.83E-06	1.89E-03	1.22E-02	2.31E-02	2.81E-02	2.87E-02	2.72E-02	2.48E-02	2.23E-02	1.99E-02	1.77E-02	1.59E-02	1.42E-02	1.28E-02	1.16E-02	1.05E-02	9.54E-03	8.71E-03	7.99E-03	7.35E-03	3.69E-03	2.21E-03
	SAC-ann100-bus-1500u	1500	1.05	100	annual	business	upwind	0.00	0.00E+00	5.71E-06	8.04E-05	2.58E-04	4.63E-04	6.40E-04	7.64E-04	8.36E-04	8.67E-04	8.69E-04	8.51E-04	8.18E-04	7.79E-04	7.39E-04	6.99E-04	6.60E-04	6.23E-04	5.88E-04	5.55E-04	5.25E-04	3.14E-04	2.07E-04
40	SAC-ann200-bus-1500d	1500	1.05	200	annual	business	downwind	0.06	3.65E-06	3.79E-03	2.44E-02	4.62E-02	5.62E-02	5.74E-02	5.43E-02	4.96E-02	4.46E-02	3.98E-02	3.55E-02	3.17E-02	2.84E-02	2.56E-02	2.31E-02	2.09E-02	1.91E-02	1.74E-02	1.60E-02	1.47E-02	7.37E-03	4.43E-03
	SAC-ann200-bus-1500u	1500	1.05	200	annual	business	upwind	0.00	0.00E+00	1.14E-05	1.61E-04	5.15E-04	9.27E-04	1.28E-03	1.53E-03	1.67E-03	1.73E-03	1.74E-03	1.70E-03	1.64E-03	1.56E-03	1.48E-03	1.40E-03	1.32E-03	1.25E-03	1.18E-03	1.11E-03	1.05E-03	6.28E-04	4.13E-04
41	SAC-ann500-bus-1500d	1500	1.05	500	annual	business	downwind	0.14	9.13E-06	9.47E-03	6.10E-02	1.15E-01	1.40E-01	1.44E-01	1.36E-01	1.24E-01	1.11E-01	9.95E-02	8.87E-02	7.93E-02	7.11E-02	6.39E-02	5.78E-02	5.24E-02	4.77E-02	4.36E-02	3.99E-02	3.67E-02	1.84E-02	1.11E-02
	SAC-ann500-bus-1500u	1500	1.05	500	annual	business	upwind	0.00	0.00E+00	2.85E-05	4.02E-04	1.29E-03	2.32E-03	3.20E-03	3.82E-03	4.18E-03	4.34E-03	4.34E-03	4.25E-03	4.09E-03	3.89E-03	3.69E-03	3.49E-03	3.30E-03	3.12E-03	2.94E-03	2.78E-03	2.62E-03	1.57E-03	1.03E-03
42	SAC-ann1000-bus-1500d	1500	1.05	1000	annual	business	downwind	0.29	1.83E-05	1.89E-02	1.22E-01	2.31E-01	2.81E-01	2.87E-01	2.72E-01	2.48E-01	2.23E-01	1.99E-01	1.77E-01	1.59E-01	1.42E-01	1.28E-01	1.16E-01	1.05E-01	9.54E-02	8.71E-02	7.99E-02	7.35E-02	3.69E-02	2.21E-02
	SAC-ann1000-bus-1500u	1500	1.05	1000	annual	business	upwind	0.01	0.00E+00	5.71E-05	8.04E-04	2.58E-03	4.63E-03	6.40E-03	7.64E-03	8.36E-03	8.67E-03	8.69E-03	8.51E-03	8.18E-03	7.79E-03	7.39E-03	6.99E-03	6.60E-03	6.23E-03	5.88E-03	5.55E-03	5.25E-03	3.14E-03	2.07E-03

707	849	990	1131	1273	1414	1556	1697	1838	1980	2121	2263	2404	2546	2687	2828	3536	4243	4950	5657	6364	7071
10.182	8.658	7.567	6.745	6.104	5.588	5.164	4.809	4.507	4.247	4.021	3.822	3.645	3.487	3.345	3.217	2.720	2.380	2.130	1.937	1.783	1.656
6.937	6.029	5.232	4.569	4.023	3.574	3.201	2.888	2.625	2.400	2.206	2.049	1.914	1.794	1.688	1.592	1.233	1.057	0.927	0.826	0.745	0.679
3.467	2.736	2.222	1.849	1.569	1.354	1.184	1.047	0.936	0.843	0.765	0.699	0.641	0.592	0.549	0.510	0.373	0.288	0.235	0.200	0.173	0.153
2.580	2.149	1.809	1.544	1.336	1.169	1.034	0.923	0.831	0.753	0.687	0.631	0.581	0.538	0.500	0.467	0.345	0.268	0.220	0.188	0.163	0.144
10.179	8.658	7.567	6.745	6.104	5.588	5.164	4.809	4.507	4.247	4.021	3.822	3.645	3.487	3.345	3.217	2.720	2.380	2.130	1.937	1.783	1.656
5.696	5.113	4.612	4.146	3.733	3.376	3.068	2.803	2.574	2.375	2.202	2.049	1.914	1.794	1.688	1.592	1.233	1.057	0.927	0.826	0.745	0.679
1.595	1.256	1.019	0.848	0.719	0.621	0.543	0.481	0.430	0.388	0.352	0.322	0.296	0.273	0.254	0.236	0.174	0.135	0.109	0.096	0.087	0.079
1.201	0.996	0.836	0.713	0.616	0.539	0.477	0.426	0.383	0.348	0.318	0.291	0.269	0.249	0.232	0.217	0.161	0.126	0.102	0.085	0.073	0.063
0.280	0.212	0.167	0.135	0.113	0.096	0.082	0.072	0.064	0.057	0.051	0.047	0.043	0.039	0.036	0.033	0.024	0.019	0.015	0.013	0.011	0.010
0.234	0.181	0.145	0.119	0.100	0.086	0.074	0.065	0.058	0.052	0.047	0.043	0.039	0.036	0.033	0.031	0.023	0.018	0.014	0.012	0.010	0.009
0.824	0.621	0.508	0.425	0.363	0.315	0.277	0.246	0.221	0.199	0.182	0.166	0.158	0.152	0.145	0.140	0.118	0.103	0.093	0.084	0.078	0.072
0.687	0.530	0.422	0.348	0.304	0.268	0.239	0.214	0.194	0.176	0.162	0.149	0.138	0.128	0.119	0.111	0.083	0.065	0.053	0.046	0.041	0.038
9.03E-04	6.68E-04	5.17E-04	4.14E-04	3.41E-04	2.87E-04	2.46E-04	2.13E-04	1.88E-04	1.67E-04	1.50E-04	1.35E-04	1.23E-04	1.13E-04	1.04E-04	9.62E-05	6.91E-05	5.30E-05	4.26E-05	3.54E-05	3.01E-05	2.62E-05
1.12E-04	8.44E-05	6.62E-05	5.37E-05	4.46E-05	3.78E-05	3.25E-05	2.84E-05	2.51E-05	2.24E-05	2.02E-05	1.83E-05	1.67E-05	1.54E-05	1.42E-05	1.31E-05	9.47E-06	7.31E-06	5.88E-06	4.91E-06	4.17E-06	3.60E-06
1.81E-03	1.34E-03	1.03E-03	8.28E-04	6.82E-04	5.73E-04	4.91E-04	4.27E-04	3.76E-04	3.34E-04	3.00E-04	2.71E-04	2.47E-04	2.26E-04	2.08E-04	1.92E-04	1.38E-04	1.06E-04	8.53E-05	7.09E-05	6.03E-05	5.24E-05
2.24E-04	1.69E-04	1.32E-04	1.07E-04	8.92E-05	7.56E-05	6.51E-05	5.68E-05	5.02E-05	4.49E-05	4.04E-05	3.66E-05	3.34E-05	3.07E-05	2.83E-05	2.63E-05	1.89E-05	1.46E-05	1.18E-05	9.82E-06	8.33E-06	7.19E-06
3.61E-03	2.67E-03	2.07E-03	1.66E-03	1.36E-03	1.15E-03	9.82E-04	8.54E-04	7.51E-04	6.68E-04	5.99E-04	5.42E-04	4.93E-04	4.52E-04	4.16E-04	3.85E-04	2.76E-04	2.12E-04	1.71E-04	1.42E-04	1.21E-04	1.05E-04
4.48E-04	3.38E-04	2.65E-04	2.15E-04	1.78E-04	1.51E-04	1.30E-04	1.14E-04	1.00E-04	8.97E-05	8.08E-05	7.33E-05	6.69E-05	6.14E-05	5.66E-05	5.25E-05	3.79E-05	2.92E-05	2.35E-05	1.96E-05	1.67E-05	1.44E-05
9.03E-03	6.68E-03	5.17E-03	4.14E-03	3.41E-03	2.87E-03	2.46E-03	2.13E-03	1.88E-03	1.67E-03	1.50E-03	1.35E-03	1.23E-03	1.13E-03	1.04E-03	9.62E-04	6.91E-04	5.30E-04	4.26E-04	3.54E-04	3.01E-04	2.62E-04
1.12E-03	8.44E-04	6.62E-04	5.37E-04	4.46E-04	3.78E-04	3.25E-04	2.84E-04	2.51E-04	2.24E-04	2.02E-04	1.83E-04	1.67E-04	1.54E-04	1.42E-04	1.31E-04	9.47E-05	7.31E-05	5.88E-05	4.91E-05	4.17E-05	3.60E-05
1.81E-02	1.34E-02	1.03E-02	8.28E-03	6.82E-03	5.73E-03	4.91E-03	4.27E-03	3.76E-03	3.34E-03	3.00E-03	2.71E-03	2.47E-03	2.26E-03	2.08E-03	1.92E-03	1.38E-03	1.06E-03	8.53E-04	7.09E-04	6.03E-04	5.24E-04
2.24E-03	1.69E-03	1.32E-03	1.07E-03	8.92E-04	7.56E-04	6.51E-04	5.68E-04	5.02E-04	4.49E-04	4.04E-04	3.66E-04	3.34E-04	3.07E-04	2.83E-04	2.63E-04	1.89E-04	1.46E-04	1.18E-04	9.82E-05	8.33E-05	7.19E-05
7.65E-04	5.78E-04	4.54E-04	3.68E-04	3.06E-04	2.59E-04	2.23E-04	1.95E-04	1.72E-04	1.54E-04	1.38E-04	1.25E-04	1.14E-04	1.05E-04	9.69E-05	8.97E-05	6.47E-05	4.99E-05	4.02E-05	3.35E-05	2.85E-05	2.48E-05
8.89E-05	6.96E-05	5.61E-05	4.62E-05	3.90E-05	3.34E-05	2.91E-05	2.55E-05	2.27E-05	2.04E-05	1.84E-05	1.68E-05	1.54E-05	1.41E-05	1.31E-05	1.22E-05	8.85E-06	6.85E-06	5.54E-06	4.62E-06	3.94E-06	3.42E-06
1.53E-03	1.16E-03	9.09E-04	7.37E-04	6.12E-04	5.18E-04	4.47E-04	3.90E-04	3.45E-04	3.07E-04	2.77E-04	2.51E-04	2.29E-04	2.10E-04	1.94E-04	1.79E-04	1.29E-04	9.98E-05	8.05E-05	6.70E-05	5.71E-05	4.95E-05
1.78E-04	1.39E-04	1.12E-04	9.25E-05	7.80E-05	6.68E-05	5.81E-05	5.10E-05	4.54E-05	4.08E-05	3.69E-05	3.36E-05	3.07E-05	2.82E-05	2.61E-05	2.43E-05	1.77E-05	1.37E-05	1.11E-05	9.25E-06	7.88E-06	6.85E-06
3.06E-03	2.31E-03	1.82E-03	1.47E-03	1.22E-03	1.04E-03	8.93E-04	7.80E-04	6.89E-04	6.15E-04	5.53E-04	5.02E-04	4.58E-04	4.20E-04	3.87E-04	3.59E-04	2.59E-04	2.00E-04	1.61E-04	1.34E-04	1.14E-04	9.91E-05
3.56E-04	2.78E-04	2.24E-04	1.85E-04	1.56E-04	1.34E-04	1.16E-04	1.02E-04	9.09E-05	8.15E-05	7.37E-05	6.71E-05	6.14E-05	5.64E-05	5.23E-05	4.86E-05	3.54E-05	2.74E-05	2.21E-05	1.85E-05	1.58E-05	1.37E-05
7.65E-03	5.78E-03	4.54E-03	3.68E-03	3.06E-03	2.59E-03	2.23E-03	1.95E-03	1.72E-03	1.54E-03	1.38E-03	1.25E-03	1.14E-03	1.05E-03	9.69E-04	8.97E-04	6.47E-04	4.99E-04	4.02E-04	3.35E-04	2.85E-04	2.48E-04
8.89E-04	6.96E-04	5.61E-04	4.62E-04	3.90E-04	3.34E-04	2.91E-04	2.55E-04	2.27E-04	2.04E-04	1.84E-04	1.68E-04	1.54E-04	1.41E-04	1.31E-04	1.22E-04	8.85E-05	6.85E-05	5.54E-05	4.62E-05	3.94E-05	3.42E-05
1.53E-02	1.16E-02	9.09E-03	7.37E-03	6.12E-03	5.18E-03	4.47E-03	3.90E-03	3.45E-03	3.07E-03	2.77E-03	2.51E-03	2.29E-03	2.10E-03	1.94E-03	1.79E-03	1.29E-03	9.98E-04	8.05E-04	6.70E-04	5.71E-04	4.95E-04
1.78E-03	1.39E-03	1.12E-03	9.25E-04	7.80E-04	6.68E-04	5.81E-04	5.10E-04	4.54E-04	4.08E-04	3.69E-04	3.36E-04	3.07E-04	2.82E-04	2.61E-04	2.43E-04	1.77E-04	1.37E-04	1.11E-04	9.25E-05	7.88E-05	6.85E-05
1.12E-03	7.89E-04	5.86E-04	4.55E-04	3.65E-04	3.01E-04	2.54E-04	2.18E-04	1.91E-04	1.69E-04	1.51E-04	1.36E-04	1.24E-04	1.14E-04	1.05E-04	9.73E-05	7.12E-05	5.62E-05	4.66E-05	3.97E-05	3.47E-05	3.11E-05
1.78E-05	1.23E-05	9.13E-06	7.31E-06	5.94E-06	5.02E-06	4.11E-06	3.65E-06	3.20E-06	2.97E-06	2.51E-06	2.28E-06	2.28E-06	2.05E-06	1.83E-06	1.83E-06	1.37E-06	1.14E-06	9.13E-07	6.85E-07	6.85E-07	4.57E-07
2.25E-03	1.58E-03	1.17E-03	9.10E-04	7.30E-04	6.03E-04	5.09E-04	4.37E-04	3.82E-04	3.37E-04	3.02E-04	2.73E-04	2.48E-04	2.27E-04	2.10E-04	1.95E-04	1.42E-04	1.12E-04	9.32E-05	7.95E-05	6.94E-05	6.21E-05
3.56E-05	2.47E-05	1.83E-05	1.46E-05	1.19E-05	1.00E-05	8.22E-06	7.31E-06	6.39E-06	5.94E-06	5.02E-06	4.57E-06	4.57E-06	4.11E-06	3.65E-06	3.65E-06	2.74E-06	2.28E-06	1.83E-06	1.37E-06	1.37E-06	9.13E-07
4.50E-03	3.16E-03	2.34E-03	1.82E-03	1.46E-03	1.21E-03	1.02E-03	8.74E-04	7.63E-04	6.75E-04	6.04E-04	5.45E-04	4.96E-04	4.55E-04	4.19E-04	3.89E-04	2.85E-04	2.25E-04	1.86E-04	1.59E-04	1.39E-04	1.24E-04
7.12E-05	4.93E-05	3.65E-05	2.92E-05	2.37E-05	2.01E-05	1.64E-05	1.46E-05	1.28E-05	1.19E-05	1.00E-05	9.13E-06	9.13E-06	8.22E-06	7.31E-06	7.31E-06	5.48E-06	4.57E-06	3.65E-06	2.74E-06	2.74E-06	1.83E-06
1.12E-02	7.89E-03	5.86E-03	4.55E-03	3.65E-03	3.01E-03	2.54E-03	2.18E-03	1.91E-03	1.69E-03	1.51E-03	1.36E-03	1.24E-03	1.14E-03	1.05E-03	9.73E-04	7.12E-04	5.62E-04	4.66E-04	3.97E-04	3.47E-04	3.11E-04
1.78E-04	1.23E-04	9.13E-05	7.31E-05	5.94E-05	5.02E-05	4.11E-05	3.65E-05	3.20E-05	2.97E-05	2.51E-05	2.28E-05	2.28E-05	2.05E-05	1.83E-05	1.83E-05	1.37E-05	1.14E-05	9.13E-06	6.85E-06	6.85E-06	4.57E-06
1.06E-03	7.45E-04	5.55E-04	4.32E-04	3.47E-04	2.87E-04	2.42E-04	2.08E-04	1.82E-04	1.61E-04	1.44E-04	1.30E-04	1.18E-04	1.08E-04	9.98E-05	9.27E-05	6.78E-05	5.37E-05	4.43E-05	3.79E-05	3.31E-05	2.95E-05
1.60E-05	1.14E-05	8.68E-06	6.85E-06	5.48E-06	4.57E-06	3.88E-06	3.42E-06	2.97E-06	2.74E-06	2.51E-06	2.28E-06	2.05E-06	1.83E-06	1.83E-06	1.60E-06	1.14E-06	9.13E-07	9.13E-07	6.85E-07	6.85E-07	4.57E-07
2.12E-03	1.49E-03	1.11E-03	8.63E-04	6.94E-04	5.73E-04	4.84E-04	4.16E-04	3.63E-04	3.21E-04	2.88E-04	2.59E-04	2.36E-04	2.16E-04	2.00E-04	1.85E-04	1.36E-04	1.07E-04	8.86E-05	7.58E-05	6.62E-05	5.89E-05
3.20E-05	2.28E-05	1.74E-05	1.37E-05	1.10E-05	9.13E-06	7.76E-06	6.85E-06	5.94E-06	5.48E-06	5.02E-06	4.57E-06	4.11E-06	3.65E-06	3.65E-06	3.20E-06	2.28E-06	1.83E-06	1.83E-06	1.37E-06	1.37E-06	9.13E-07
4.23E-03	2.98E-03	2.22E-03	1.73E-03	1.39E-03	1.15E-03	9.67E-04	8.32E-04	7.27E-04	6.43E-04	5.75E-04	5.19E-04	4.72E-04	4.33E-04	3.99E-04	3.71E-04	2.71E-04	2.15E-04	1.77E-04	1.52E-04	1.32E-04	1.18E-04
6.39E-05	4.57E-05	3.47E-05	2.74E-05	2.19E-05	1.83E-05	1.55E-05	1.37E-05	1.19E-05	1.10E-05	1.00E-05	9.13E-06	8.22E-06	7.31E-06	7.31E-06	6.39E-06	4.57E-06	3.65E-06	3.65E-06	2.74E-06	2.74E-06	1.83E-06
1.06E-02	7.45E-03	5.55E-03	4.32E-03	3.47E-03	2.87E-03	2.42E-03	2.08E-03	1.82E-03	1.61E-03	1.44E-03	1.30E-03	1.18E-03	1.08E-03	9.98E-04	9.27E-04	6.78E-04	5.37E-04	4.43E-04	3.79E-04	3.31E-04	2.95E-04
1.60E-04	1.14E-04	8.68E-05	6.85E-05	5.48E-05	4.57E-05	3.88E-05	3.42E-05	2.97E-05	2.74E-05	2.51E-05	2.28E-05	2.05E-05	1.83E-05	1.83E-05	1.60E-05	1.14E-05	9.13E-06	9.13E-06	6.85E-06	6.85E-06	4.57E-06
8.12E-04	5.79E-04	4.36E-04	3.42E-04	2.78E-04	2.31E-04	1.97E-04	1.70E-04	1.49E-04	1.33E-04	1.19E-04	1.08E-04	9.83E-05	9.03E-05	8.34E-05	7.75E-05	5.68E-05	4.47E-05	3.69E-05	3.14E-05	2.73E-05	2.42E-05
8.69E-05	6.35E-05	4.87E-05	3.89E-05	3.21E-05	2.69E-05	2.32E-05	2.02E-05	1.78E-05	1.60E-05	1.44E-05	1.30E-05	1.20E-05	1.10E-05	1.02E-05	9.47E-06	6.96E-06	5.48E-06	4.45E-06	3.77E-06	3.20E-06	2.85E-06
1.62E-03	1.16E-03	8.72E-04	6.85E-04	5.55E-04	4.62E-04	3.93E-04	3.40E-04	2.99E-04	2.65E-04	2.38E-04	2.16E-04	1.97E-04	1.81E-04	1.67E-04	1.55E-04	1.14E-04	8.95E-05	7.37E-05	6.28E-05	5.46E-05	4.84E-05
1.74E-04	1.27E-04	9.75E-05	7.79E-05	6.42E-05	5.39E-05	4.63E-05	4.04E-05	3.56E-05	3.20E-05	2.88E-05	2.60E-05	2.40E-05	2.19E-05	2.03E-05	1.89E-05	1.39E-05	1.10E-05	8.90E-06	7.53E-06	6.39E-06	5.71E-06
3.25E-03	2.32E-03	1.74E-03	1.37E-03	1.11E-03	9.25E-04	7.86E-04	6.80E-04	5.97E-04	5.31E-04	4.76E-04	4.31E-04	3.93E-04	3.61E-04	3.34E-04	3.10E-04	2.27E-04	1.79E-04	1.47E-04	1.26E-04	1.09E-04	9.68E-05
3.47E-04	2.54E-04	1.95E-04	1.56E-04	1.28E-04	1.08E-04	9.27E-05	8.08E-05	7.12E-05	6.39E-05	5.75E-05	5.21E-05	4.79E-05	4.38E-05	4.06E-05	3.79E-05	2.79E-05	2.19E-05	1.78E-05	1.51E-05	1.28E-05	1.14E-05
8.12E-03	5.79E-03	4.36E-03	3.42E-03	2.78E-03	2.31E-03	1.97E-03	1.70E-03	1.49E-03	1.33E-03	1.19E-03	1.08E-03	9.83E-04	9.03E-04	8.34E-04	7.75E-04	5.68E-04	4.47E-04	3.69E-04	3.14E-04	2.73E-04	2.42E-04
8.69E-04	6.35E-04	4.87E-04	3.89E-04	3.21E-04	2.69E-04	2.32E-04	2.02E-04	1.78E-04	1.60E-04	1.44E-04	1.30E-04	1.20E-04	1.10E-04	1.02E-04	9.47E-05	6.96E-05	5.48E-05	4.45E-05	3.77E-05	3.20E-05	2.85E-05
1.62E-02	1.16E-02	8.72E-03	6.85E-03	5.55E-03	4.62E-03	3.93E-03	3.40E-03	2.99E-03	2.65E-03	2.38E-03	2.16E-03	1.97E-03	1.81E-03	1.67E-03	1.55E-03	1.14E-03	8.95E-04	7.37E-04	6.28E-04	5.46E-04	4.84E-04
1.74E-03	1.27E-03	9.75E-04	7.79E-04	6.42E-04	5.39E-04	4.63E-04	4.04E-04	3.56E-04	3.20E-04	2.88E-04	2.60E-04	2.40E-04	2.19E-04	2.03E-04	1.89E-04	1.39E-04	1.10E-04	8.90E-05	7.53E-05	6.39E-05	5.71E-05
7.40E-04	5.32E-04	4.04E-04	3.18E-04	2.59E-04	2.16E-04	1.84E-04	1.60E-04	1.40E-04	1.25E-04	1.12E-04	1.02E-04	9.29E-05	8.54E-05	7.89E-05	7.33E-05	5.39E-05	4.26E-05	3.50E-05	2.99E-05	2.60E-05	2.31E-05
7.33E-05	5.49E-05	4.29E-05	3.47E-05	2.89E-05	2.45E-05	2.11E-05	1.85E-05	1.64E-05	1.47E-05	1.34E-05	1.21E-05	1.12E-05	1.03E-05	9.47E-06	8.90E-06	6.51E-06	5.14E-06	4.22E-06	3.54E-06	3.08E-06	2.74E-06
1.48E-03	1.06E-03	8.07E-04	6.37E-04	5.18E-04	4.33E-04	3.69E-04	3.19E-04	2.81E-04	2.50E-04	2.24E-04	2.03E-04	1.86E-04	1.71E-04	1.58E-04	1.47E-04	1.08E-04	8.52E-05	7.01E-05	5.98E-05	5.21E-05	4.61E-05
1.47E-04	1.10E-04	8.58E-05	6.94E-05	5.78E-05	4.91E-05	4.22E-05	3.70E-05	3.29E-05	2.95E-05	2.67E-05	2.42E-05	2.24E-05	2.05E-05	1.89E-05	1.78E-05	1.30E-05	1.03E-05	8.45E-06	7.08E-06	6.16E-06	5.48E-06
2.96E-03	2.13E-03	1.61E-03	1.27E-03	1.04E-03	8.65E-04	7.37E-04	6.39E-04	5.62E-04	5.00E-04	4.49E-04	4.07E-04	3.72E-04	3.42E-04	3.16E-04	2.93E-04	2.16E-04	1.70E-04	1.40E-04	1.20E-04	1.04E-04	9.22E-05
2.93E-04	2.20E-04	1.72E-04	1.39E-04	1.16E-04	9.82E-05	8.45E-05	7.40E-05	6.58E-05	5.89E-05	5.34E-05	4.84E-05	4.47E-05	4.11E-05	3.79E-05	3.56E-05	2.60E-05	2.05E-05	1.69E-05	1.42E-05	1.23E-05	1.10E-05
7.40E-03	5.32E-03	4.04E-03	3.18E-03	2.59E-03	2.16E-03	1.84E-03	1.60E-03	1.40E-03	1.25E-03	1.12E-03	1.02E-03	9.29E-04	8.54E-04	7.89E-04	7.33E-04	5.39E-04	4.26E-04	3.50E-04	2.99E-04	2.60E-04	2.31E-04
7.33E-04	5.49E-04	4.29E-04	3.47E-04	2.89E-04	2.45E-04	2.11E-04	1.85E-04	1.64E-04	1.47E-04	1.34E-04	1.21E-04	1.12E-04	1.03E-04	9.47E-05	8.90E-05	6.51E-05	5.14E-05	4.22E-05	3.54E-05	3.08E-05	2.74E-05
1.48E-02	1.06E-02	8.07E-03	6.37E-03	5.18E-03	4.33E-03	3.69E-03	3.19E-03	2.81E-03	2.50E-03	2.24E-03	2.03E-03	1.86E-03	1.71E-03	1.58E-03	1.47E-03	1.08E-03	8.52E-04	7.01E-04	5.98E-04	5.21E-04	4.61E-04
1.47E-03	1.10E-03	8.58E-04	6.94E-04	5.78E-04	4.91E-04	4.22E-04	3.70E-04	3.29E-04	2.95E-04	2.67E-04	2.42E-04	2.24E-04	2.05E-04	1.89E-04	1.78E-04	1.30E-04	1.03E-04	8.45E-05	7.08E-05	6.16E-05	5.48E-05

Table SAC2: Acrolein 1-Hour Hazard Index for Sacramento

concentrations in micrograms/m^3 Acrolein MRL 0.19 ug/m3

Model Run number	Name	Engine Size (hp)	Hours of run time per year	Model outputs	Scenario	Max	Distance Downwind (meters)									
							14	28	42	57	71	85	99	113	127	141
1	Sac-1H-all-500	500	8760	max 1-hour	all	0.10	0.06	0.10	0.10	0.09	0.08	0.08	0.08	0.08	0.08	0.07
2	Sac-1H-all-1500	1500	8760	max 1-hour	all	0.01	0.00	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.00
3	Sac-1H-sum-500	500	732	max 1-hour	summer	0.10	0.05	0.10	0.10	0.09	0.08	0.07	0.06	0.05	0.05	0.04
4	Sac-1H-sum-1500	1500	732	max 1-hour	summer	0.01	0.00	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.00
5	Sac-1H-bus-500	500	4380	max 1-hour	business	0.10	0.06	0.10	0.10	0.09	0.08	0.08	0.08	0.08	0.08	0.07
6	Sac-1H-sum-1500	1500	4380	max 1-hour	business	0.01	0.00	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.00

Model Run	Name	184	198	212	226	240	255	269	283	424	566	707	849	990	1131	1273
1	Sac-1H-all-500	0.06	0.05	0.05	0.05	0.04	0.04	0.04	0.04	0.03	0.02	0.02	0.01	0.01	0.01	0.01
2	Sac-1H-all-1500	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3	Sac-1H-sum-500	0.03	0.03	0.03	0.02	0.02	0.02	0.02	0.02	0.01	0.01	0.01	0.00	0.00	0.00	0.00
4	Sac-1H-sum-1500	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5	Sac-1H-bus-500	0.06	0.05	0.05	0.05	0.04	0.04	0.04	0.04	0.03	0.02	0.02	0.01	0.01	0.01	0.01
6	Sac-1H-sum-1500	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Model Run	Name	1697	1838	1980	2121	2263	2404	2546	2687	2828	3536	4243	4950	5657	6364	7071
1	Sac-1H-all-500	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00
2	Sac-1H-all-1500	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3	Sac-1H-sum-500	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4	Sac-1H-sum-1500	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5	Sac-1H-bus-500	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00
6	Sac-1H-sum-1500	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Table SAC3: 24-Hour PM Concentrations as Percent of CalEPA 24-Hour Standard for Sacramento

concentrations in micrograms/m^3 PM10 Standard 50 ug/m3

Model Run number	**Name**	**Engine Size (hp)**	**Hours of run time per year**	**Model outputs**	**Scenario**	**Max**	**Distance Downwind (meters)**									
							14	28	42	57	71	85	99	113	127	141
7	Sac-24H-all-500	500	8760	24-hour	all	63.58%	8.07%	60.33%	63.58%	55.77%	48.56%	40.25%	33.33%	28.99%	25.93%	23.03%
8	Sac-24H-all-1500	1500	8760	24-hour	all	19.81%	0.05%	4.16%	14.50%	19.81%	19.81%	17.75%	15.74%	14.30%	13.29%	12.14%
9	Sac-24H-sum-500	500	732	24-hour	summer	36.89%	4.17%	27.12%	36.89%	31.70%	24.86%	19.40%	15.34%	12.35%	10.11%	8.41%
10	Sac-24H-sum-1500	1500	732	24-hour	summer	10.63%	0.02%	2.09%	6.23%	9.11%	10.63%	10.39%	9.45%	8.34%	7.29%	6.37%
11	Sac-24H-bus-500	500	4380	24-hour	business	54.38%	7.32%	43.39%	54.38%	46.72%	36.64%	28.57%	23.70%	21.51%	19.22%	17.08%
12	Sac-24H-sum-1500	1500	4380	24-hour	business	15.19%	0.05%	3.67%	11.01%	14.00%	15.19%	14.98%	13.69%	12.13%	10.62%	9.27%

Model Run	**Name**	184	198	212	226	240	255	269	283	424	566	707	849	990	1131	1273
7	Sac-24H-all-500	16.22%	14.94%	13.83%	12.84%	11.96%	11.17%	10.46%	9.82%	5.72%	4.19%	3.19%	2.51%	2.04%	1.70%	1.44%
8	Sac-24H-all-1500	9.00%	8.24%	7.57%	6.98%	6.70%	6.46%	6.22%	5.99%	4.09%	2.92%	2.40%	1.99%	1.67%	1.43%	1.23%
9	Sac-24H-sum-500	5.25%	4.58%	4.03%	3.58%	3.20%	2.87%	2.60%	2.36%	1.23%	0.79%	0.56%	0.42%	0.33%	0.27%	0.23%
10	Sac-24H-sum-1500	4.34%	3.86%	3.45%	3.10%	2.80%	2.54%	2.31%	2.12%	1.03%	0.63%	0.47%	0.36%	0.29%	0.24%	0.20%
11	Sac-24H-bus-500	12.01%	10.75%	9.66%	8.72%	7.90%	7.19%	6.56%	6.12%	3.56%	2.33%	1.65%	1.24%	1.02%	0.85%	0.73%
12	Sac-24H-sum-1500	6.32%	5.62%	5.25%	5.01%	4.76%	4.52%	4.28%	4.05%	2.64%	1.86%	1.37%	1.06%	0.84%	0.70%	0.61%

Model Run	**Name**	1697	1838	1980	2121	2263	2404	2546	2687	2828	3536	4243	4950	5657	6364	7071
7	Sac-24H-all-500	0.96%	0.86%	0.78%	0.70%	0.64%	0.59%	0.55%	0.51%	0.47%	0.35%	0.27%	0.22%	0.19%	0.17%	0.16%
8	Sac-24H-all-1500	0.85%	0.77%	0.70%	0.64%	0.58%	0.54%	0.50%	0.46%	0.43%	0.32%	0.25%	0.20%	0.17%	0.15%	0.13%
9	Sac-24H-sum-500	0.14%	0.13%	0.11%	0.10%	0.09%	0.09%	0.08%	0.07%	0.07%	0.05%	0.04%	0.03%	0.03%	0.02%	0.02%
10	Sac-24H-sum-1500	0.13%	0.12%	0.10%	0.09%	0.09%	0.08%	0.07%	0.07%	0.06%	0.05%	0.04%	0.03%	0.02%	0.02%	0.02%
11	Sac-24H-bus-500	0.49%	0.44%	0.40%	0.36%	0.33%	0.32%	0.30%	0.29%	0.28%	0.24%	0.21%	0.19%	0.17%	0.16%	0.14%
12	Sac-24H-sum-1500	0.43%	0.39%	0.35%	0.32%	0.30%	0.28%	0.26%	0.24%	0.22%	0.17%	0.13%	0.11%	0.09%	0.08%	0.08%

Table SAC4: Chronic Cancer Risk for Sacramento

concentrations in micrograms/m^3

Model Run number	Name	Engine Size (hp)	Hours of run time per year	Model outputs	Scenario	Wind	Max	Distance Downwind (meters)																											
								14	28	42	57	71	85	99	113	127	141	156	170	184	198	212	226	240	255	269	283	424	566	707	849	990	1131	1273	1414	1556	1697
1	Sac-ann-50-all-500d	500	50	annual	all	downwind	9.7	0.4	6.9	9.7	8.9	7.4	6.0	4.9	4.0	3.4	2.9	2.6	2.3	2.0	1.8	1.7	1.5	1.4	1.3	1.2	1.1	0.6	0.4	0.3	0.2	0.2	0.1	0.1	0.1	0.1	0.1
	Sac-ann-50-all-500u	500	50	annual	all	upwind	0.3	0.0	0.1	0.2	0.3	0.3	0.3	0.3	0.3	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
14	Sac-ann-100-all-500d	500	100	annual	all	downwind	19.4	0.9	13.8	19.4	17.8	14.7	11.9	9.7	8.1	6.8	5.9	5.1	4.6	4.1	3.7	3.4	3.1	2.8	2.6	2.4	2.2	1.2	0.8	0.5	0.4	0.3	0.2	0.2	0.2	0.1	0.1
	Sac-ann-100-all-500u	500	100	annual	all	upwind	0.7	0.0	0.2	0.4	0.6	0.7	0.6	0.6	0.5	0.5	0.5	0.4	0.4	0.4	0.3	0.3	0.3	0.3	0.3	0.2	0.2	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0
15	Sac-ann-200-all-500d	500	200	annual	all	downwind	38.8	1.7	27.6	38.8	35.7	29.4	23.8	19.4	16.1	13.6	11.8	10.3	9.1	8.2	7.4	6.7	6.1	5.6	5.2	4.8	4.5	2.5	1.6	1.1	0.8	0.6	0.5	0.4	0.3	0.3	0.3
	Sac-ann-200-all-500u	500	200	annual	all	upwind	1.3	0.0	0.4	0.9	1.2	1.3	1.3	1.2	1.1	1.0	0.9	0.8	0.8	0.7	0.7	0.6	0.6	0.6	0.5	0.5	0.5	0.3	0.2	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.0
16	Sac-ann-500-all-500d	500	500	annual	all	downwind	97.1	4.4	68.9	97.1	89.2	73.6	59.5	48.5	40.3	34.1	29.4	25.7	22.8	20.4	18.5	16.8	15.4	14.1	13.0	12.1	11.2	6.2	3.9	2.7	2.0	1.6	1.2	1.0	0.9	0.7	0.6
	Sac-ann-500-all-500u	500	500	annual	all	upwind	3.3	0.0	0.9	2.2	3.1	3.3	3.2	2.9	2.7	2.5	2.3	2.1	1.9	1.8	1.7	1.6	1.5	1.4	1.3	1.2	1.2	0.7	0.5	0.3	0.3	0.2	0.2	0.1	0.1	0.1	0.1
17	Sac-ann-1000-all-500d	500	1000	annual	all	downwind	194.2	8.7	137.9	194.2	178.4	147.1	119.0	97.1	80.6	68.2	58.8	51.5	45.6	40.9	36.9	33.6	30.7	28.2	26.1	24.2	22.5	12.3	7.8	5.4	4.0	3.1	2.5	2.0	1.7	1.5	1.3
	Sac-ann-1000-all-500u	500	1000	annual	all	upwind	6.6	0.0	1.8	4.5	6.2	6.6	6.4	5.9	5.4	5.0	4.6	4.2	3.9	3.6	3.4	3.2	3.0	2.8	2.6	2.5	2.3	1.4	0.9	0.7	0.5	0.4	0.3	0.3	0.2	0.2	0.2
18	Sac-ann-50-all-1500d	1500	50	annual	all	downwind	2.6	0.0	0.1	1.0	2.0	2.5	2.6	2.4	2.2	2.0	1.8	1.7	1.5	1.4	1.3	1.2	1.1	1.0	0.9	0.9	0.8	0.5	0.3	0.2	0.2	0.1	0.1	0.1	0.1	0.1	0.1
	Sac-ann-50-all-1500u	1500	50	annual	all	upwind	0.1	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
19	Sac-ann-100-all-1500d	1500	100	annual	all	downwind	5.1	0.0	0.3	2.0	4.0	4.9	5.1	4.9	4.5	4.1	3.7	3.3	3.0	2.8	2.5	2.3	2.1	2.0	1.9	1.7	1.6	1.0	0.6	0.5	0.3	0.3	0.2	0.2	0.2	0.1	0.1
	Sac-ann-100-all-1500u	1500	100	annual	all	upwind	0.2	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
20	Sac-ann-200-all-1500d	1500	200	annual	all	downwind	10.2	0.0	0.6	4.1	8.0	9.9	10.2	9.8	9.0	8.2	7.4	6.7	6.0	5.5	5.1	4.6	4.3	4.0	3.7	3.5	3.3	1.9	1.3	0.9	0.7	0.5	0.4	0.4	0.3	0.3	0.2
	Sac-ann-200-all-1500u	1500	200	annual	all	upwind	0.3	0.0	0.0	0.0	0.1	0.1	0.2	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.2	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0
21	Sac-ann-500-all-1500d	1500	500	annual	all	downwind	25.5	0.0	1.5	10.2	20.0	24.7	25.5	24.4	22.5	20.4	18.4	16.7	15.1	13.8	12.6	11.6	10.7	10.0	9.3	8.7	8.2	4.8	3.2	2.3	1.7	1.4	1.1	0.9	0.8	0.7	0.6
	Sac-ann-500-all-1500u	1500	500	annual	all	upwind	0.8	0.0	0.0	0.1	0.2	0.4	0.5	0.6	0.7	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.7	0.7	0.7	0.7	0.5	0.4	0.3	0.2	0.2	0.1	0.1	0.1	0.1	0.1
22	Sac-ann-1000-all-1500d	1500	1000	annual	all	downwind	51.1	0.0	3.0	20.5	40.0	49.4	51.1	48.8	44.9	40.8	36.8	33.3	30.2	27.6	25.3	23.2	21.5	20.0	18.6	17.4	16.3	9.6	6.4	4.6	3.5	2.7	2.2	1.8	1.6	1.3	1.2
	Sac-ann-1000-all-1500u	1500	1000	annual	all	upwind	1.7	0.0	0.0	0.1	0.4	0.7	1.1	1.3	1.5	1.6	1.6	1.7	1.7	1.6	1.6	1.5	1.5	1.5	1.4	1.4	1.3	1.0	0.7	0.5	0.4	0.3	0.3	0.2	0.2	0.2	0.2
23	SAC-ann50-sum-500d	500	50	annual	summer	downwind	32.9	2.1	26.4	32.9	28.0	21.9	17.1	13.5	10.9	8.9	7.4	6.2	5.3	4.6	4.0	3.5	3.1	2.7	2.5	2.2	2.0	0.9	0.5	0.3	0.2	0.2	0.1	0.1	0.1	0.1	0.1
	SAC-ann50-sum-500u	500	50	annual	summer	upwind	0.2	0.0	0.1	0.2	0.2	0.2	0.2	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
24	SAC-ann100-sum-500d	500	100	annual	summer	downwind	65.8	4.2	52.8	65.8	55.9	43.9	34.2	27.0	21.7	17.7	14.7	12.4	10.6	9.1	7.9	7.0	6.2	5.5	4.9	4.4	4.0	1.8	1.0	0.7	0.5	0.4	0.3	0.2	0.2	0.2	0.1
	SAC-ann100-sum-500u	500	100	annual	summer	upwind	0.4	0.0	0.2	0.4	0.4	0.4	0.4	0.3	0.3	0.2	0.2	0.2	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
25	SAC-ann200-sum-500d	500	200	annual	summer	downwind	131.6	8.5	105.7	131.6	111.9	87.7	68.4	54.0	43.4	35.5	29.5	24.8	21.2	18.2	15.9	13.9	12.3	11.0	9.8	8.9	8.0	3.7	2.1	1.3	0.9	0.7	0.5	0.4	0.4	0.3	0.3
	SAC-ann200-sum-500u	500	200	annual	summer	upwind	0.8	0.0	0.4	0.7	0.8	0.8	0.7	0.6	0.5	0.5	0.4	0.3	0.3	0.3	0.2	0.2	0.2	0.2	0.2	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
26	SAC-ann500-sum-500d	500	500	annual	summer	downwind	329.0	21.1	264.2	329.0	279.6	219.3	171.0	135.1	108.6	88.7	73.7	62.1	52.9	45.6	39.7	34.9	30.8	27.5	24.6	22.2	20.1	9.1	5.2	3.4	2.4	1.8	1.4	1.1	0.9	0.8	0.7
	SAC-ann500-sum-500u	500	500	annual	summer	upwind	2.1	0.1	1.0	1.8	2.1	2.0	1.8	1.6	1.4	1.2	1.0	0.9	0.8	0.7	0.6	0.5	0.5	0.4	0.4	0.3	0.3	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
28	SAC-ann50-sum-1500d	1500	50	annual	summer	downwind	8.9	0.0	0.7	4.4	7.7	8.9	8.7	7.9	7.0	6.2	5.4	4.7	4.2	3.7	3.3	2.9	2.6	2.4	2.1	2.0	1.8	0.8	0.5	0.3	0.2	0.2	0.1	0.1	0.1	0.1	0.1
	SAC-ann50-sum-1500u	1500	50	annual	summer	upwind	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
29	SAC-ann100-sum-1500d	1500	100	annual	summer	downwind	17.8	0.0	1.5	8.7	15.4	17.8	17.4	15.9	14.1	12.4	10.8	9.5	8.4	7.4	6.6	5.9	5.3	4.7	4.3	3.9	3.6	1.7	1.0	0.6	0.4	0.3	0.3	0.2	0.2	0.1	0.1
	SAC-ann100-sum-1500u	1500	100	annual	summer	upwind	0.1	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
30	SAC-ann200-sum-1500d	1500	200	annual	summer	downwind	35.5	0.0	3.0	17.5	30.8	35.5	34.7	31.8	28.2	24.7	21.6	19.0	16.7	14.8	13.1	11.7	10.5	9.5	8.6	7.8	7.1	3.4	1.9	1.3	0.9	0.7	0.5	0.4	0.3	0.3	0.2
	SAC-ann200-sum-1500u	1500	200	annual	summer	upwind	0.2	0.0	0.0	0.0	0.1	0.1	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
31	SAC-ann500-sum-1500d	1500	500	annual	summer	downwind	88.8	0.0	7.4	43.6	77.0	88.8	86.9	79.4	70.5	61.8	54.1	47.5	41.8	36.9	32.8	29.3	26.3	23.7	21.5	19.5	17.8	8.4	4.9	3.2	2.2	1.7	1.3	1.0	0.9	0.7	0.6
	SAC-ann500-sum-1500u	1500	500	annual	summer	upwind	0.5	0.0	0.0	0.1	0.2	0.3	0.4	0.5	0.5	0.5	0.5	0.4	0.4	0.4	0.4	0.3	0.3	0.3	0.3	0.2	0.2	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
33	SAC-ann50-bus-500d	500	50	annual	business	downwind	16.5	0.8	12.1	16.5	14.9	12.2	9.8	7.9	6.5	5.4	4.5	3.8	3.3	2.9	2.5	2.2	2.0	1.8	1.6	1.5	1.3	0.6	0.4	0.2	0.2	0.1	0.1	0.1	0.1	0.1	0.1
	SAC-ann50-bus-500u	500	50	annual	business	upwind	0.6	0.0	0.2	0.4	0.5	0.6	0.5	0.5	0.4	0.4	0.3	0.3	0.3	0.2	0.2	0.2	0.2	0.2	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
34	SAC-ann100-bus-500d	500	100	annual	business	downwind	33.0	1.7	24.2	33.0	29.9	24.4	19.6	15.8	12.9	10.7	9.0	7.7	6.6	5.7	5.0	4.5	4.0	3.6	3.2	2.9	2.7	1.3	0.7	0.5	0.3	0.3	0.2	0.2	0.1	0.1	0.1
	SAC-ann100-bus-500u	500	100	annual	business	upwind	1.1	0.0	0.4	0.8	1.1	1.1	1.1	0.9	0.8	0.7	0.6	0.6	0.5	0.5	0.4	0.4	0.3	0.3	0.3	0.3	0.2	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
35	SAC-ann200-bus-500d	500	200	annual	business	downwind	66.0	3.4	48.5	66.0	59.7	48.8	39.2	31.6	25.8	21.4	18.0	15.3	13.2	11.5	10.1	8.9	8.0	7.1	6.4	5.8	5.3	2.5	1.5	1.0	0.7	0.5	0.4	0.3	0.3	0.2	0.2
	SAC-ann200-bus-500u	500	200	annual	business	upwind	2.3	0.0	0.7	1.7	2.2	2.3	2.1	1.9	1.7	1.5	1.3	1.1	1.0	0.9	0.8	0.7	0.7	0.6	0.6	0.5	0.5	0.2	0.2	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0
36	SAC-ann500-bus-500d	500	500	annual	business	downwind	165.1	8.4	121.2	165.1	149.3	122.0	97.9	79.0	64.6	53.5	45.0	38.3	33.0	28.7	25.2	22.3	19.9	17.9	16.1	14.6	13.3	6.3	3.7	2.4	1.7	1.3	1.0	0.8	0.7	0.6	0.5
	SAC-ann500-bus-500u	500	500	annual	business	upwind	5.7	0.0	1.8	4.1	5.5	5.7	5.3	4.7	4.1	3.7	3.2	2.9	2.5	2.3	2.0	1.8	1.7	1.5	1.4	1.3	1.2	0.6	0.4	0.3	0.2	0.1	0.1	0.1	0.1	0.1	0.1
37	SAC-ann1000-bus-500d	500	1000	annual	business	downwind	330.2	16.8	242.5	330.2	298.6	244.1	195.8	158.0	129.1	107.1	90.0	76.7	66.0	57.5	50.5	44.7	39.8	35.7	32.2	29.2	26.6	12.6	7.4	4.9	3.5	2.6	2.1	1.7	1.4	1.2	1.0
	SAC-ann1000-bus-500u	500	1000	annual	business	upwind	11.3	0.1	3.5	8.3	10.9	11.3	10.5	9.4	8.3	7.3	6.4	5.7	5.1	4.5	4.1	3.7	3.4	3.1	2.8	2.6	2.4	1.2	0.8	0.5	0.4	0.3	0.2	0.2	0.2	0.1	0.1
38	SAC-ann50-bus-1500d	1500	50	annual	business	downwind	4.3	0.0	0.3	1.8	3.5	4.2	4.3	4.1	3.7	3.3	3.0	2.7	2.4	2.1	1.9	1.7	1.6	1.4	1.3	1.2	1.1	0.6	0.3	0.2	0.2	0.1	0.1	0.1	0.1	0.1	0.0
	SAC-ann50-bus-1500u	1500	50	annual	business	upwind	0.1	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
39	SAC-ann100-bus-1500d	1500	100	annual	business	downwind	8.6	0.0	0.6	3.7	6.9	8.4	8.6	8.1	7.4	6.7	6.0	5.3	4.8	4.3	3.8	3.5	3.1	2.9	2.6	2.4	2.2	1.1	0.7	0.4	0.3	0.2	0.2	0.2	0.1	0.1	0.1
	SAC-ann100-bus-1500u	1500	100	annual	business	upwind	0.3	0.0	0.0	0.0	0.1	0.1	0.2	0.2	0.3	0.3	0.3	0.3	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
40	SAC-ann200-bus-1500d	1500	200	annual	business	downwind	17.2	0.0	1.1	7.3	13.9	16.9	17.2	16.3	14.9	13.4	11.9	10.6	9.5	8.5	7.7	6.9	6.3	5.7	5.2	4.8	4.4	2.2	1.3	0.9	0.6	0.5	0.4	0.3	0.3	0.2	0.2
	SAC-ann200-bus-1500u	1500	200	annual	business	upwind	0.5	0.0	0.0	0.0	0.2	0.3	0.4	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.4	0.4	0.4	0.4	0.4	0.3	0.3	0.2	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0
41	SAC-ann500-bus-1500d	1500	500	annual	business	downwind	43.1	0.0	2.8	18.3	34.6	42.1	43.1	40.7	37.2	33.4	29.8	26.6	23.8	21.3	19.2	17.3	15.7	14.3	13.1	12.0	11.0	5.5	3.3	2.2	1.6	1.2	1.0	0.8	0.6	0.6	0.5
	SAC-ann500-bus-1500u	1500	500	annual	business	upwind	1.3	0.0	0.0	0.1	0.4	0.7	1.0	1.1	1.3	1.3	1.3	1.3	1.2	1.2	1.1	1.0	1.0	0.9	0.9	0.8	0.8	0.5	0.3	0.2	0.2	0.1	0.1	0.1	0.1	0.1	0.1
42	SAC-ann1000-bus-1500d	1500	1000	annual	business	downwind	86.1	0.0	5.7	36.6	69.3	84.3	86.1	81.5	74.4	66.8	59.7	53.2	47.6	42.6	38.4	34.7	31.4	28.6	26.1	24.0	22.0	11.1	6.6	4.4	3.2	2.4	1.9	1.6	1.3	1.1	1.0
	SAC-ann1000-bus-1500u	1500	1000	annual	business	upwind	2.6	0.0	0.0	0.2	0.8	1.4	1.9	2.3	2.5	2.6	2.6	2.6	2.5	2.3	2.2	2.1	2.0	1.9	1.8	1.7	1.6	0.9	0.6	0.4	0.3	0.3	0.2	0.2	0.1	0.1	0.1

Model Run number	Name	1838	1980	2121	2263	2404	2546	2687	2828	3536	4243	4950	5657	6364	7071
1	Sac-ann-50-all-500d	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Sac-ann-50-all-500u	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
14	Sac-ann-100-all-500d	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0
	Sac-ann-100-all-500u	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
15	Sac-ann-200-all-500d	0.2	0.2	0.2	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.0
	Sac-ann-200-all-500u	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
16	Sac-ann-500-all-500d	0.6	0.5	0.4	0.4	0.4	0.3	0.3	0.3	0.2	0.2	0.1	0.1	0.1	0.1
	Sac-ann-500-all-500u	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
17	Sac-ann-1000-all-500d	1.1	1.0	0.9	0.8	0.7	0.7	0.6	0.6	0.4	0.3	0.3	0.2	0.2	0.2
	Sac-ann-1000-all-500u	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0
18	Sac-ann-50-all-1500d	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Sac-ann-50-all-1500u	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
19	Sac-ann-100-all-1500d	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0
	Sac-ann-100-all-1500u	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
20	Sac-ann-200-all-1500d	0.2	0.2	0.2	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0
	Sac-ann-200-all-1500u	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
21	Sac-ann-500-all-1500d	0.5	0.5	0.4	0.4	0.3	0.3	0.3	0.3	0.2	0.1	0.1	0.1	0.1	0.1
	Sac-ann-500-all-1500u	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
22	Sac-ann-1000-all-1500d	1.0	0.9	0.8	0.8	0.7	0.6	0.6	0.5	0.4	0.3	0.2	0.2	0.2	0.1
	Sac-ann-1000-all-1500u	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0
23	SAC-ann50-sum-500d	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	SAC-ann50-sum-500u	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
24	SAC-ann100-sum-500d	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0
	SAC-ann100-sum-500u	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
25	SAC-ann200-sum-500d	0.2	0.2	0.2	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.0
	SAC-ann200-sum-500u	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
26	SAC-ann500-sum-500d	0.6	0.5	0.5	0.4	0.4	0.3	0.3	0.3	0.2	0.2	0.1	0.1	0.1	0.1
	SAC-ann500-sum-500u	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
28	SAC-ann50-sum-1500d	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	SAC-ann50-sum-1500u	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
29	SAC-ann100-sum-1500d	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0
	SAC-ann100-sum-1500u	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
30	SAC-ann200-sum-1500d	0.2	0.2	0.2	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.0
	SAC-ann200-sum-1500u	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
31	SAC-ann500-sum-1500d	0.5	0.5	0.4	0.4	0.4	0.3	0.3	0.3	0.2	0.2	0.1	0.1	0.1	0.1
	SAC-ann500-sum-1500u	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
33	SAC-ann50-bus-500d	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	SAC-ann50-bus-500u	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
34	SAC-ann100-bus-500d	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	SAC-ann100-bus-500u	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
35	SAC-ann200-bus-500d	0.2	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0
	SAC-ann200-bus-500u	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
36	SAC-ann500-bus-500d	0.4	0.4	0.4	0.3	0.3	0.3	0.3	0.2	0.2	0.1	0.1	0.1	0.1	0.1
	SAC-ann500-bus-500u	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
37	SAC-ann1000-bus-500d	0.9	0.8	0.7	0.6	0.6	0.5	0.5	0.5	0.3	0.3	0.2	0.2	0.2	0.1
	SAC-ann1000-bus-500u	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0
38	SAC-ann50-bus-1500d	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	SAC-ann50-bus-1500u	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
39	SAC-ann100-bus-1500d	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	SAC-ann100-bus-1500u	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
40	SAC-ann200-bus-1500d	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0
	SAC-ann200-bus-1500u	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
41	SAC-ann500-bus-1500d	0.4	0.4	0.3	0.3	0.3	0.3	0.2	0.2	0.2	0.1	0.1	0.1	0.1	0.1
	SAC-ann500-bus-1500u	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
42	SAC-ann1000-bus-1500d	0.8	0.7	0.7	0.6	0.6	0.5	0.5	0.4	0.3	0.3	0.2	0.2	0.2	0.1
	SAC-ann1000-bus-1500u	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0

Table SD1: Model Results for San Diego

concentrations in micrograms/m³

Model Run number	Name	Engine Size (hp)	PM Emissions (lb/hr)	Hours of run time per year	Model outputs	Scenario	Wind	Max	Distance Downwind (meters)*																					
									14	28	42	57	71	85	99	113	127	141	156	170	184	198	212	226	240	255	269	283	424
1	SD-1H-all-500	500	1.1	8760	max 1-hour	all		95.94	40.392	65.705	74.252	95.937	91.562	80.719	70.516	62.195	55.566	50.219	45.824	42.152	39.036	36.361	34.039	32.005	30.208	28.610	27.178	25.889	17.703
2	SD-1H-all-1500	1500	1.05	8760	max 1-hour	all		22.50	0.605	19.288	22.502	20.979	20.016	18.074	16.154	14.463	13.105	11.955	11.074	10.581	10.095	9.583	9.074	8.587	8.132	7.711	7.325	6.973	7.438
3	SD-1H-sum-500	500	1.1	732	max 1-hour	summer		65.70	27.731	65.705	62.097	55.304	48.270	41.875	37.155	33.856	30.297	26.916	23.874	21.207	18.896	16.902	15.182	13.696	12.408	11.287	10.307	9.448	6.830
4	SD-1H-sum-1500	1500	1.05	732	max 1-hour	summer		20.77	0.092	12.788	20.774	18.924	19.271	17.632	16.154	14.463	13.105	11.955	11.074	10.188	9.469	8.847	8.332	7.912	7.541	7.165	6.793	6.433	3.959
5	SD-1H-bus-500	500	1.1	4380	max 1-hour	business		95.94	40.392	65.705	74.252	95.937	91.562	80.719	70.516	62.195	55.566	50.219	45.824	42.152	39.036	36.361	34.039	32.005	30.208	28.610	27.178	25.889	17.703
6	SD-1H-bus-1500	1500	1.05	4380	max 1-hour	business		22.50	0.605	19.288	22.502	20.979	20.016	18.074	16.154	14.463	13.105	11.955	11.074	10.581	10.095	9.583	9.074	8.587	8.132	7.711	7.325	6.973	7.419
7	SD-24H-all-500	500	1.1	8760	24-hour	all		28.99	4.281	21.555	24.797	28.994	26.686	22.812	19.119	16.002	13.470	11.433	9.794	8.465	7.380	6.484	5.775	5.224	4.992	4.801	4.615	4.434	3.070
8	SD-24H-all-1500	1500	1.05	8760	24-hour	all		7.44	0.033	2.099	5.522	7.444	7.346	6.543	7.199	7.272	7.005	6.571	6.076	5.580	5.108	4.670	4.272	3.912	3.589	3.299	3.040	2.807	2.013
9	SD-H-sum-500	500	1.1	732	24-hour	summer		10.96	1.675	9.445	10.963	10.124	8.299	6.904	5.701	4.728	3.958	3.353	2.875	2.487	2.170	1.907	1.689	1.506	1.350	1.217	1.103	1.004	0.480
10	SD-24H-sum-1500	1500	1.05	732	24-hour	summer		3.03	0.004	0.663	1.931	2.715	2.985	3.029	2.864	2.622	2.350	2.088	1.886	1.710	1.551	1.408	1.281	1.168	1.068	0.979	0.900	0.830	0.422
11	SD-24H-bus-500	500	1.1	4380	24-hour	business		19.91	4.158	17.696	19.915	18.864	16.650	13.960	11.593	9.657	8.110	6.876	5.887	5.088	4.436	3.899	3.452	3.114	2.901	2.734	2.588	2.455	1.565
12	SD-24H-bus-1500	1500	1.05	4380	24-hour	business		5.84	0.033	2.026	4.374	5.773	5.836	5.530	5.258	4.782	4.460	4.110	3.754	3.420	3.113	2.835	2.586	2.364	2.166	1.989	1.832	1.692	1.093
13	SD-ann50-all-500d	500	1.1	50	annual	all	downwind	0.034	1.54E-03	2.30E-02	3.43E-02	3.39E-02	2.96E-02	2.51E-02	2.12E-02	1.81E-02	1.58E-02	1.39E-02	1.25E-02	1.12E-02	1.02E-02	9.40E-03	8.67E-03	8.03E-03	7.48E-03	6.98E-03	6.53E-03	6.13E-03	3.57E-03
	SD-ann50-all-500u	500	1.1	50	annual	all	upwind	0.003	1.78E-05	8.95E-04	2.21E-03	2.90E-03	2.96E-03	2.76E-03	2.49E-03	2.25E-03	2.04E-03	1.86E-03	1.71E-03	1.59E-03	1.47E-03	1.38E-03	1.29E-03	1.21E-03	1.14E-03	1.07E-03	1.02E-03	9.60E-04	5.87E-04
14	SD-ann100-all-500d	500	1.1	100	annual	all	downwind	0.069	3.08E-03	4.60E-02	6.85E-02	6.78E-02	5.93E-02	5.01E-02	4.23E-02	3.63E-02	3.16E-02	2.78E-02	2.49E-02	2.25E-02	2.05E-02	1.88E-02	1.73E-02	1.61E-02	1.50E-02	1.40E-02	1.31E-02	1.23E-02	7.13E-03
	SD-ann100-all-500u	500	1.1	100	annual	all	upwind	0.006	3.55E-05	1.79E-03	4.42E-03	5.79E-03	5.93E-03	5.52E-03	4.99E-03	4.50E-03	4.08E-03	3.72E-03	3.43E-03	3.17E-03	2.95E-03	2.75E-03	2.58E-03	2.42E-03	2.28E-03	2.15E-03	2.03E-03	1.92E-03	1.17E-03
15	SD-ann200-all-500d	500	1.1	200	annual	all	downwind	0.137	6.16E-03	9.20E-02	1.37E-01	1.36E-01	1.19E-01	1.00E-01	8.47E-02	7.25E-02	6.31E-02	5.57E-02	4.98E-02	4.50E-02	4.10E-02	3.76E-02	3.47E-02	3.21E-02	2.99E-02	2.79E-02	2.61E-02	2.45E-02	1.43E-02
	SD-ann200-all-500u	500	1.1	200	annual	all	upwind	0.012	7.10E-05	3.58E-03	8.83E-03	1.16E-02	1.19E-02	1.10E-02	9.97E-03	8.99E-03	8.16E-03	7.45E-03	6.85E-03	6.34E-03	5.90E-03	5.50E-03	5.16E-03	4.84E-03	4.56E-03	4.30E-03	4.06E-03	3.84E-03	2.35E-03
16	SD-ann500-all-500d	500	1.1	500	annual	all	downwind	0.343	1.54E-02	2.30E-01	3.43E-01	3.39E-01	2.96E-01	2.51E-01	2.12E-01	1.81E-01	1.58E-01	1.39E-01	1.25E-01	1.12E-01	1.02E-01	9.40E-02	8.67E-02	8.03E-02	7.48E-02	6.98E-02	6.53E-02	6.13E-02	3.57E-02
	SD-ann500-all-500u	500	1.1	500	annual	all	upwind	0.030	1.78E-04	8.95E-03	2.21E-02	2.90E-02	2.96E-02	2.76E-02	2.49E-02	2.25E-02	2.04E-02	1.86E-02	1.71E-02	1.59E-02	1.47E-02	1.38E-02	1.29E-02	1.21E-02	1.14E-02	1.07E-02	1.02E-02	9.60E-03	5.87E-03
17	SD-ann1000-all-500d	500	1.1	1000	annual	all	downwind	0.685	3.08E-02	4.60E-01	6.85E-01	6.78E-01	5.93E-01	5.01E-01	4.23E-01	3.63E-01	3.16E-01	2.78E-01	2.49E-01	2.25E-01	2.05E-01	1.88E-01	1.73E-01	1.61E-01	1.50E-01	1.40E-01	1.31E-01	1.23E-01	7.13E-02
	SD-ann1000-all-500u	500	1.1	1000	annual	all	upwind	0.059	3.55E-04	1.79E-02	4.42E-02	5.79E-02	5.93E-02	5.52E-02	4.99E-02	4.50E-02	4.08E-02	3.72E-02	3.43E-02	3.17E-02	2.95E-02	2.75E-02	2.58E-02	2.42E-02	2.28E-02	2.15E-02	2.03E-02	1.92E-02	1.17E-02
18	SD-ann50-all-1500d	1500	1.05	50	annual	all	downwind	0.009	3.42E-07	4.68E-04	3.22E-03	6.44E-03	8.27E-03	8.92E-03	8.89E-03	8.53E-03	8.04E-03	7.51E-03	7.00E-03	6.51E-03	6.08E-03	5.69E-03	5.34E-03	5.03E-03	4.75E-03	4.49E-03	4.26E-03	4.05E-03	2.61E-03
	SD-ann50-all-1500u	1500	1.05	50	annual	all	upwind	0.001	0.00E+00	5.88E-06	8.03E-05	2.46E-04	4.26E-04	5.72E-04	6.72E-04	7.29E-04	7.56E-04	7.62E-04	7.56E-04	7.38E-04	7.17E-04	6.95E-04	6.73E-04	6.51E-04	6.29E-04	6.08E-04	5.87E-04	5.68E-04	4.05E-04
19	SD-ann100-all-1500d	1500	1.05	100	annual	all	downwind	0.018	6.85E-07	9.37E-04	6.45E-03	1.29E-02	1.65E-02	1.78E-02	1.78E-02	1.71E-02	1.61E-02	1.50E-02	1.40E-02	1.30E-02	1.22E-02	1.14E-02	1.07E-02	1.01E-02	9.49E-03	8.99E-03	8.52E-03	8.10E-03	5.23E-03
	SD-ann100-all-1500u	1500	1.05	100	annual	all	upwind	0.002	0.00E+00	1.18E-05	1.61E-04	4.92E-04	8.52E-04	1.14E-03	1.34E-03	1.46E-03	1.51E-03	1.52E-03	1.51E-03	1.48E-03	1.43E-03	1.39E-03	1.35E-03	1.30E-03	1.26E-03	1.22E-03	1.17E-03	1.14E-03	8.10E-04
20	SD-ann200-all-1500d	1500	1.05	200	annual	all	downwind	0.036	1.37E-06	1.87E-03	1.29E-02	2.58E-02	3.31E-02	3.57E-02	3.56E-02	3.41E-02	3.22E-02	3.00E-02	2.80E-02	2.60E-02	2.43E-02	2.27E-02	2.14E-02	2.01E-02	1.90E-02	1.80E-02	1.70E-02	1.62E-02	1.05E-02
	SD-ann200-all-1500u	1500	1.05	200	annual	all	upwind	0.003	0.00E+00	2.35E-05	3.21E-04	9.84E-04	1.70E-03	2.29E-03	2.69E-03	2.91E-03	3.03E-03	3.05E-03	3.02E-03	2.95E-03	2.87E-03	2.78E-03	2.69E-03	2.60E-03	2.52E-03	2.43E-03	2.35E-03	2.27E-03	1.62E-03
21	SD-ann500-all-1500d	1500	1.05	500	annual	all	downwind	0.089	3.42E-06	4.68E-03	3.22E-02	6.44E-02	8.27E-02	8.92E-02	8.89E-02	8.53E-02	8.04E-02	7.51E-02	7.00E-02	6.51E-02	6.08E-02	5.69E-02	5.34E-02	5.03E-02	4.75E-02	4.49E-02	4.26E-02	4.05E-02	2.61E-02
	SD-ann500-all-1500u	1500	1.05	500	annual	all	upwind	0.008	0.00E+00	5.88E-05	8.03E-04	2.46E-03	4.26E-03	5.72E-03	6.72E-03	7.29E-03	7.56E-03	7.62E-03	7.56E-03	7.38E-03	7.17E-03	6.95E-03	6.73E-03	6.51E-03	6.29E-03	6.08E-03	5.87E-03	5.68E-03	4.05E-03
22	SD-ann1000-all-1500d	1500	1.05	1000	annual	all	downwind	0.178	6.85E-06	9.37E-03	6.45E-02	1.29E-01	1.65E-01	1.78E-01	1.78E-01	1.71E-01	1.61E-01	1.50E-01	1.40E-01	1.30E-01	1.22E-01	1.14E-01	1.07E-01	1.01E-01	9.49E-02	8.99E-02	8.52E-02	8.10E-02	5.23E-02
	SD-ann1000-all-1500u	1500	1.05	1000	annual	all	upwind	0.015	0.00E+00	1.18E-04	1.61E-03	4.92E-03	8.52E-03	1.14E-02	1.34E-02	1.46E-02	1.51E-02	1.52E-02	1.51E-02	1.48E-02	1.43E-02	1.39E-02	1.35E-02	1.30E-02	1.26E-02	1.22E-02	1.17E-02	1.14E-02	8.10E-03
23	SD-ann-50-sum-500d	500	1.1	50	annual	summer	downwind	0.026	1.46E-03	1.93E-02	2.61E-02	2.34E-02	1.90E-02	1.51E-02	1.21E-02	9.80E-03	8.08E-03	6.76E-03	5.73E-03	4.92E-03	4.27E-03	3.74E-03	3.30E-03	2.93E-03	2.63E-03	2.36E-03	2.14E-03	1.95E-03	9.14E-04
	SD-ann-50-sum-500u	500	1.1	50	annual	summer	upwind	0.000	5.34E-07	1.21E-05	2.44E-05	2.82E-05	2.60E-05	2.22E-05	1.85E-05	1.53E-05	1.28E-05	1.08E-05	9.16E-06	7.86E-06	6.79E-06	5.95E-06	5.19E-06	4.58E-06	4.12E-06	3.66E-06	3.28E-06	2.98E-06	1.30E-06
24	SD-ann-100-sum-500d	500	1.1	100	annual	summer	downwind	0.052	2.93E-03	3.85E-02	5.22E-02	4.69E-02	3.79E-02	3.02E-02	2.41E-02	1.96E-02	1.62E-02	1.35E-02	1.15E-02	9.84E-03	8.53E-03	7.47E-03	6.60E-03	5.87E-03	5.25E-03	4.73E-03	4.28E-03	3.89E-03	1.83E-03
	SD-ann-100-sum-500u	500	1.1	100	annual	summer	upwind	0.000	1.07E-06	2.41E-05	4.88E-05	5.63E-05	5.20E-05	4.44E-05	3.69E-05	3.07E-05	2.56E-05	2.15E-05	1.83E-05	1.57E-05	1.36E-05	1.19E-05	1.04E-05	9.16E-06	8.24E-06	7.33E-06	6.56E-06	5.95E-06	2.59E-06
25	SD-ann-200-sum-500d	500	1.1	200	annual	summer	downwind	0.104	5.86E-03	7.70E-02	1.04E-01	9.37E-02	7.59E-02	6.03E-02	4.83E-02	3.92E-02	3.23E-02	2.70E-02	2.29E-02	1.97E-02	1.71E-02	1.49E-02	1.32E-02	1.17E-02	1.05E-02	9.46E-03	8.56E-03	7.79E-03	3.66E-03
	SD-ann-200-sum-500u	500	1.1	200	annual	summer	upwind	0.000	2.14E-06	4.82E-05	9.77E-05	1.13E-04	1.04E-04	8.88E-05	7.39E-05	6.14E-05	5.13E-05	4.30E-05	3.66E-05	3.14E-05	2.72E-05	2.38E-05	2.08E-05	1.83E-05	1.65E-05	1.47E-05	1.31E-05	1.19E-05	5.19E-06
26	SD-ann-500-sum-500d	500	1.1	500	annual	summer	downwind	0.780	4.38E-02	5.76E-01	7.80E-01	7.01E-01	5.67E-01	4.51E-01	3.61E-01	2.93E-01	2.42E-01	2.02E-01	1.71E-01	1.47E-01	1.28E-01	1.12E-01	9.87E-02	8.77E-02	7.85E-02	7.07E-02	6.40E-02	5.82E-02	2.73E-02
	SD-ann-500-sum-500u	500	1.1	500	annual	summer	upwind	0.001	1.60E-05	3.61E-04	7.31E-04	8.42E-04	7.79E-04	6.64E-04	5.53E-04	4.59E-04	3.84E-04	3.22E-04	2.74E-04	2.35E-04	2.03E-04	1.78E-04	1.55E-04	1.37E-04	1.23E-04	1.10E-04	9.82E-05	8.90E-05	3.88E-05
27	SD-ann-50-sum-1500d	1500	1.05	50	annual	summer	downwind	0.007	2.29E-07	4.55E-04	2.90E-03	5.52E-03	6.75E-03	6.90E-03	6.51E-03	5.92E-03	5.29E-03	4.69E-03	4.16E-03	3.70E-03	3.30E-03	2.96E-03	2.66E-03	2.40E-03	2.18E-03	1.99E-03	1.81E-03	1.66E-03	8.19E-04
	SD-ann-50-sum-1500u	1500	1.05	50	annual	summer	upwind	0.000	0.00E+00	1.53E-07	1.07E-06	2.90E-06	4.88E-06	6.18E-06	6.79E-06	6.87E-06	6.64E-06	6.18E-06	5.72E-06	5.27E-06	4.73E-06	4.27E-06	3.89E-06	3.51E-06	3.21E-06	2.90E-06	2.67E-06	2.44E-06	1.14E-06
28	SD-ann-100-sum-1500d	1500	1.05	100	annual	summer	downwind	0.014	4.58E-07	9.09E-04	5.81E-03	1.10E-02	1.35E-02	1.38E-02	1.30E-02	1.18E-02	1.06E-02	9.39E-03	8.33E-03	7.41E-03	6.61E-03	5.92E-03	5.32E-03	4.81E-03	4.36E-03	3.97E-03	3.63E-03	3.33E-03	1.64E-03
	SD-ann-100-sum-1500u	1500	1.05	100	annual	summer	upwind	0.000	0.00E+00	3.05E-07	2.14E-06	5.80E-06	9.77E-06	1.24E-05	1.36E-05	1.37E-05	1.33E-05	1.24E-05	1.14E-05	1.05E-05	9.46E-06	8.55E-06	7.78E-06	7.02E-06	6.41E-06	5.80E-06	5.34E-06	4.88E-06	2.29E-06
29	SD-ann-200-sum-1500d	1500	1.05	200	annual	summer	downwind	0.028	9.16E-07	1.82E-03	1.16E-02	2.21E-02	2.70E-02	2.76E-02	2.60E-02	2.37E-02	2.12E-02	1.88E-02	1.67E-02	1.48E-02	1.32E-02	1.18E-02	1.06E-02	9.61E-03	8.72E-03	7.94E-03	7.26E-03	6.66E-03	3.27E-03
	SD-ann-200-sum-1500u	1500	1.05	200	annual	summer	upwind	0.000	0.00E+00	6.10E-07	4.27E-06	1.16E-05	1.95E-05	2.47E-05	2.72E-05	2.75E-05	2.66E-05	2.47E-05	2.29E-05	2.11E-05	1.89E-05	1.71E-05	1.56E-05	1.40E-05	1.28E-05	1.16E-05	1.07E-05	9.77E-06	4.58E-06
30	SD-ann-500-sum-1500d	1500	1.05	500	annual	summer	downwind	0.206	6.85E-06	1.36E-02	8.69E-02	1.65E-01	2.02E-01	2.06E-01	1.95E-01	1.77E-01	1.58E-01	1.40E-01	1.25E-01	1.11E-01	9.88E-02	8.85E-02	7.96E-02	7.19E-02	6.52E-02	5.94E-02	5.43E-02	4.98E-02	2.45E-02
	SD-ann-500-sum-1500u	1500	1.05	500	annual	summer	upwind	0.000	0.00E+00	4.57E-06	3.20E-05	8.68E-05	1.46E-04	1.85E-04	2.03E-04	2.05E-04	1.99E-04	1.85E-04	1.71E-04	1.58E-04	1.42E-04	1.28E-04	1.16E-04	1.05E-04	9.59E-05	8.68E-05	7.99E-05	7.31E-05	3.42E-05
31	SD-ann-50-bus-500d	500	1.1	50	annual	business	downwind	0.062	3.05E-03	4.40E-02	6.20E-02	5.77E-02	4.81E-02	3.91E-02	3.19E-02	2.64E-02	2.21E-02	1.89E-02	1.63E-02	1.43E-02	1.26E-02	1.12E-02	1.01E-02	9.10E-03	8.27E-03	7.56E-03	6.93E-03	6.39E-03	3.30E-03
	SD-ann-50-bus-500u	500	1.1	50	annual	business	upwind	0.003	2.60E-05	9.85E-04	2.10E-03	2.55E-03	2.50E-03	2.25E-03	1.97E-03	1.71E-03	1.49E-03	1.30E-03	1.14E-03	1.01E-03	9.03E-04	8.10E-04	7.30E-04	6.62E-04	6.03E-04	5.52E-04	5.07E-04	4.68E-04	2.42E-04
32	SD-ann-100-bus-500d	500	1.1	100	annual	business	downwind	0.124	6.10E-03	8.81E-02	1.24E-01	1.15E-01	9.61E-02	7.82E-02	6.38E-02	5.27E-02	4.43E-02	3.77E-02	3.26E-02	2.85E-02	2.52E-02	2.24E-02	2.01E-02	1.82E-02	1.65E-02	1.51E-02	1.39E-02	1.28E-02	6.59E-03
	SD-ann-100-bus-500u	500	1.1	100	annual	business	upwind	0.005	5.21E-05	1.97E-03	4.20E-03	5.10E-03	5.00E-03	4.51E-03	3.94E-03	3.42E-03	2.97E-03	2.60E-03	2.29E-03	2.03E-03	1.81E-03	1.62E-03	1.46E-03	1.32E-03	1.21E-03	1.10E-03	1.01E-03	9.36E-04	4.83E-04
33	SD-ann-200-bus-500d	500	1.1	200	annual	business	downwind	0.248	1.22E-02	1.76E-01	2.48E-01	2.31E-01	1.92E-01	1.56E-01	1.28E-01	1.05E-01	8.85E-02	7.55E-02	6.52E-02	5.70E-02	5.04E-02	4.49E-02	4.03E-02	3.64E-02	3.31E-02	3.02E-02	2.77E-02	2.56E-02	1.32E-02
	SD-ann-200-bus-500u	500	1.1	200	annual	business	upwind	0.010	1.04E-04	3.94E-03	8.40E-03	1.02E-02	1.00E-02	9.01E-03	7.87E-03	6.84E-03	5.95E-03	5.20E-03	4.57E-03	4.05E-03	3.61E-03	3.24E-03	2.92E-03	2.65E-03	2.41E-03	2.21E-03	2.03E-03	1.87E-03	9.67E-04
34	SD-ann-500-bus-500d	500	1.1	500	annual	business	downwind	0.620	3.05E-02	4.40E-01	6.20E-01	5.77E-01	4.81E-01	3.91E-01	3.19E-01	2.64E-01	2.21E-01	1.89E-01	1.63E-01	1.43E-01	1.26E-01	1.12E-01	1.01E-01	9.10E-02	8.27E-02	7.56E-02	6.93E-02	6.39E-02	3.30E-02
	SD-ann-500-bus-500u	500	1.1	500	annual	business	upwind	0.026	2.60E-04	9.85E-03	2.10E-02	2.55E-02	2.50E-02	2.25E-02	1.97E-02	1.71E-02	1.49E-02	1.30E-02	1.14E-02	1.01E-02	9.03E-03	8.10E-03	7.30E-03	6.62E-03	6.03E-03	5.52E-03	5.07E-03	4.68E-03	2.42E-03
35	SD-ann-1000-bus-500d	500	1.1	1000	annual	business	downwind	1.240	6.10E-02	8.81E-01	1.24E+00	1.15E+00	9.61E-01	7.82E-01	6.38E-01	5.27E-01	4.43E-01	3.77E-01	3.26E-01	2.85E-01	2.52E-01	2.24E-01	2.01E-01	1.82E-01	1.65E-01	1.51E-01	1.39E-01	1.28E-01	6.59E-02
	SD-ann-1000-bus-500u	500	1.1	1000	annual	business	upwind	0.051	5.21E-04	1.97E-02	4.20E-02	5.10E-02	5.00E-02	4.51E-02	3.94E-02	3.42E-02	2.97E-02	2.60E-02	2.29E-02	2.03E-02	1.81E-02	1.62E-02	1.46E-02	1.32E-02	1.21E-02	1.10E-02	1.01E-02	9.36E-03	4.83E-03
36	SD-ann-50-bus-1500d	1500	1.05	50	annual	business	downwind	0.016	6.85E-07	9.20E-04	6.30E-03	1.24E-02	1.55E-02	1.62E-02	1.56E-02	1.44E-02	1.31E-02	1.19E-02	1.07E-02	9.67E-03	8.77E-03	7.98E-03	7.29E-03	6.69E-03	6.16E-03	5.69E-03	5.27E-03	4.90E-03	2.69E-03
	SD-ann-50-bus-1500u	1500	1.05	50	annual	business	upwind	0.001	0.00E+00	8.11E-06	9.77E-05	2.66E-04	4.23E-04	5.32E-04	5.92E-04	6.15E-04	6.14E-04	5.96E-04	5.70E-04	5.38E-04	5.05E-04	4.74E-04	4.44E-04	4.16E-04	3.90E-04	3.66E-04	3.44E-04	3.23E-04	1.88E-04
37	SD-ann-100-bus-1500d	1500	1.05	100	annual	business	downwind	0.032	1.37E-06	1.84E-03	1.26E-02	2.47E-02	3.09E-02	3.23E-02	3.11E-02	2.88E-02	2.62E-02	2.37E-02	2.14E-02	1.93E-02	1.75E-02	1.60E-02	1.46E-02	1.34E-02	1.23E-02	1.14E-02	1.05E-02	9.81E-03	5.38E-03
	SD-ann-100-bus-1500u	1500	1.05	100	annual	business	upwind	0.001	0.00E+00	1.62E-05	1.95E-04	5.33E-04	8.46E-04	1.06E-03	1.18E-03	1.23E-03	1.23E-03	1.19E-03	1.14E-03	1.08E-03	1.01E-03	9.48E-04	8.88E-04	8.32E-04	7.80E-04	7.32E-04	6.87E-04	6.47E-04	3.76E-04
38	SD-ann-200-bus-1500d	1500	1.05	200	annual	business	downwind	0.065	2.74E-06	3.68E-03	2.52E-02	4.94E-02	6.19E-02	6.46E-02	6.22E-02	5.76E-02	5.25E-02	4.74E-02	4.28E-02	3.87E-02	3.51E-02	3.19E-02	2.92E-02	2.67E-02	2.46E-02	2.28E-02	2.11E-02	1.96E-02	1.08E-02
	SD-ann-200-bus-1500u	1500	1.05	200	annual	business	upwind	0.002	0.00E+00	3.24E-05	3.91E-04	1.07E-03	1.69E-03	2.13E-03	2.37E-03	2.46E-03	2.45E-03	2.38E-03	2.28E-03	2.15E-03	2.02E-03	1.90E-03	1.78E-03	1.66E-03	1.56E-03	1.46E-03	1.37E-03	1.29E-03	7.53E-04
39	SD-ann-500-bus-1500d	1500	1.05	500	annual	business	downwind	0.162	6.85E-06	9.20E-03	6.30E-02	1.24E-01	1.55E-01	1.62E-01	1.56E-01	1.44E-01	1.31E-01	1.19E-01	1.07E-01	9.67E-02	8.77E-02	7.98E-02	7.29E-02	6.69E-02	6.16E-02	5.69E-02	5.27E-02	4.90E-02	2.69E-02
	SD-ann-500-bus-1500u	1500	1.05	500	annual	business	upwind	0.006	0.00E+00	8.11E-05	9.77E-04	2.66E-03	4.23E-03	5.32E-03	5.92E-03	6.15E-03	6.14E-03	5.96E-03	5.70E-03	5.38E-03	5.05E-03	4.74E-03	4.44E-03	4.16E-03	3.90E-03	3.66E-03	3.44E-03	3.23E-03	1.88E-03
40	SD-ann-1000-bus-1500d	1500	1.05	1000	annual	business	downwind	0.323	1.37E-05	1.84E-02	1.26E-01	2.47E-01	3.09E-01	3.23E-01	3.11E-01	2.88E-01	2.62E-01	2.37E-01	2.14E-01	1.93E-01	1.75E-01	1.60E-01	1.46E-01	1.34E-01	1.23E-01	1.14E-01	1.05E-01	9.81E-02	5.38E-02
	SD-ann-1000-bus-1500u	1500	1.05	1000	annual	business	upwind	0.012	0.00E+00	1.62E-04	1.95E-03	5.33E-03	8.46E-03	1.06E-02	1.18E-02	1.23E-02	1.23E-02	1.19E-02	1.14E-02	1.08E-02	1.01E-02	9.48E-03	8.88E-03	8.32E-03	7.80E-03	7.32E-03	6.87E-03	6.47E-03	3.76E-03

*The distance downwind from the BUG represents the distance along a diagonal line in a coordinate grid.

Model Run number	Name	566	707	849	990	1131	1273	1414	1556	1697	1838	1980	2121	2263	2404	2546	2687	2828	3536	4243	4950	5657	6364	7071
1	SD-1H-all-500	13.594	11.121	9.468	8.282	7.390	6.694	6.134	5.674	5.290	4.963	4.681	4.436	4.221	4.030	3.859	3.705	3.567	3.032	2.666	2.398	2.192	2.027	1.893
2	SD-1H-all-1500	6.699	5.703	5.178	4.683	4.217	3.803	3.443	3.132	2.864	2.632	2.430	2.253	2.098	1.960	1.838	1.729	1.631	1.264	1.025	0.859	0.739	0.680	0.632
3	SD-1H-sum-500	5.216	4.032	3.204	2.614	2.135	1.856	1.604	1.405	1.245	1.113	1.008	0.920	0.845	0.780	0.724	0.675	0.632	0.475	0.378	0.312	0.266	0.230	0.203
4	SD-1H-sum-1500	3.483	2.923	2.460	2.089	1.782	1.559	1.369	1.215	1.091	0.988	0.901	0.826	0.762	0.707	0.658	0.615	0.578	0.439	0.351	0.292	0.249	0.216	0.191
5	SD-1H-bus-500	13.594	11.121	9.468	8.282	7.390	6.694	6.134	5.674	5.290	4.963	4.681	4.436	4.221	4.030	3.859	3.705	3.567	3.032	2.666	2.398	2.192	2.027	1.893
6	SD-1H-bus-1500	6.687	5.695	4.819	4.110	3.547	3.098	2.736	2.441	2.197	1.993	1.821	1.673	1.546	1.436	1.339	1.253	1.177	0.899	0.723	0.603	0.516	0.451	0.400
7	SD-24H-all-500	2.182	1.621	1.254	1.004	0.825	0.693	0.592	0.514	0.452	0.401	0.374	0.351	0.331	0.314	0.298	0.284	0.271	0.221	0.187	0.163	0.144	0.129	0.117
8	SD-24H-all-1500	1.569	1.247	1.009	0.832	0.699	0.596	0.516	0.453	0.401	0.359	0.323	0.294	0.268	0.248	0.231	0.216	0.202	0.152	0.121	0.099	0.083	0.072	0.063
9	SD-H-sum-500	0.321	0.232	0.177	0.141	0.115	0.097	0.083	0.073	0.064	0.058	0.053	0.048	0.044	0.041	0.039	0.036	0.034	0.027	0.022	0.018	0.016	0.014	0.013
10	SD-24H-sum-1500	0.256	0.192	0.151	0.122	0.101	0.086	0.075	0.066	0.059	0.053	0.048	0.044	0.041	0.038	0.036	0.034	0.032	0.025	0.020	0.017	0.015	0.013	0.012
11	SD-24H-bus-500	1.190	0.964	0.813	0.705	0.623	0.559	0.508	0.465	0.430	0.400	0.374	0.351	0.331	0.314	0.298	0.284	0.271	0.221	0.187	0.163	0.144	0.129	0.117
12	SD-24H-bus-1500	0.805	0.627	0.519	0.436	0.372	0.323	0.284	0.252	0.226	0.205	0.186	0.171	0.158	0.146	0.136	0.127	0.120	0.091	0.073	0.061	0.052	0.045	0.040
13	SD-ann50-all-500d	2.34E-03	1.65E-03	1.24E-03	9.69E-04	7.82E-04	6.47E-04	5.46E-04	4.69E-04	4.09E-04	3.60E-04	3.21E-04	2.88E-04	2.61E-04	2.37E-04	2.17E-04	2.00E-04	1.85E-04	1.33E-04	1.02E-04	8.13E-05	6.74E-05	5.71E-05	4.94E-05
	SD-ann50-all-500u	3.93E-04	2.81E-04	2.12E-04	1.66E-04	1.35E-04	1.12E-04	9.43E-05	8.10E-05	7.05E-05	6.21E-05	5.52E-05	4.95E-05	4.47E-05	4.07E-05	3.72E-05	3.42E-05	3.16E-05	2.24E-05	1.71E-05	1.35E-05	1.11E-05	9.36E-06	8.05E-06
14	SD-ann100-all-500d	4.67E-03	3.31E-03	2.48E-03	1.94E-03	1.56E-03	1.29E-03	1.09E-03	9.39E-04	8.18E-04	7.21E-04	6.41E-04	5.76E-04	5.21E-04	4.74E-04	4.35E-04	4.00E-04	3.70E-04	2.65E-04	2.03E-04	1.63E-04	1.35E-04	1.14E-04	9.89E-05
	SD-ann100-all-500u	7.86E-04	5.63E-04	4.24E-04	3.33E-04	2.69E-04	2.23E-04	1.89E-04	1.62E-04	1.41E-04	1.24E-04	1.10E-04	9.91E-05	8.95E-05	8.14E-05	7.44E-05	6.84E-05	6.32E-05	4.49E-05	3.41E-05	2.71E-05	2.23E-05	1.87E-05	1.61E-05
15	SD-ann200-all-500d	9.34E-03	6.62E-03	4.96E-03	3.87E-03	3.13E-03	2.59E-03	2.19E-03	1.88E-03	1.64E-03	1.44E-03	1.28E-03	1.15E-03	1.04E-03	9.49E-04	8.69E-04	8.00E-04	7.40E-04	5.30E-04	4.06E-04	3.25E-04	2.69E-04	2.29E-04	1.98E-04
	SD-ann200-all-500u	1.57E-03	1.13E-03	8.49E-04	6.66E-04	5.39E-04	4.46E-04	3.77E-04	3.24E-04	2.82E-04	2.48E-04	2.21E-04	1.98E-04	1.79E-04	1.63E-04	1.49E-04	1.37E-04	1.26E-04	8.97E-05	6.83E-05	5.41E-05	4.45E-05	3.74E-05	3.22E-05
16	SD-ann500-all-500d	2.34E-02	1.65E-02	1.24E-02	9.69E-03	7.82E-03	6.47E-03	5.46E-03	4.69E-03	4.09E-03	3.60E-03	3.21E-03	2.88E-03	2.61E-03	2.37E-03	2.17E-03	2.00E-03	1.85E-03	1.33E-03	1.02E-03	8.13E-04	6.74E-04	5.71E-04	4.94E-04
	SD-ann500-all-500u	3.93E-03	2.81E-03	2.12E-03	1.66E-03	1.35E-03	1.12E-03	9.43E-04	8.10E-04	7.05E-04	6.21E-04	5.52E-04	4.95E-04	4.47E-04	4.07E-04	3.72E-04	3.42E-04	3.16E-04	2.24E-04	1.71E-04	1.35E-04	1.11E-04	9.36E-05	8.05E-05
17	SD-ann1000-all-500d	4.67E-02	3.31E-02	2.48E-02	1.94E-02	1.56E-02	1.29E-02	1.09E-02	9.39E-03	8.18E-03	7.21E-03	6.41E-03	5.76E-03	5.21E-03	4.74E-03	4.35E-03	4.00E-03	3.70E-03	2.65E-03	2.03E-03	1.63E-03	1.35E-03	1.14E-03	9.89E-04
	SD-ann1000-all-500u	7.86E-03	5.63E-03	4.24E-03	3.33E-03	2.69E-03	2.23E-03	1.89E-03	1.62E-03	1.41E-03	1.24E-03	1.10E-03	9.91E-04	8.95E-04	8.14E-04	7.44E-04	6.84E-04	6.32E-04	4.49E-04	3.41E-04	2.71E-04	2.23E-04	1.87E-04	1.61E-04
18	SD-ann50-all-1500d	1.83E-03	1.36E-03	1.05E-03	8.34E-04	6.84E-04	5.72E-04	4.88E-04	4.22E-04	3.70E-04	3.28E-04	2.93E-04	2.64E-04	2.39E-04	2.19E-04	2.01E-04	1.85E-04	1.72E-04	1.24E-04	9.52E-05	7.65E-05	6.35E-05	5.40E-05	4.67E-05
	SD-ann50-all-1500u	2.96E-04	2.24E-04	1.75E-04	1.41E-04	1.16E-04	9.76E-05	8.34E-05	7.22E-05	6.33E-05	5.61E-05	5.01E-05	4.51E-05	4.09E-05	3.73E-05	3.42E-05	3.15E-05	2.92E-05	2.09E-05	1.59E-05	1.27E-05	1.05E-05	8.85E-06	7.59E-06
19	SD-ann100-all-1500d	3.66E-03	2.71E-03	2.09E-03	1.67E-03	1.37E-03	1.14E-03	9.76E-04	8.44E-04	7.40E-04	6.55E-04	5.86E-04	5.28E-04	4.79E-04	4.37E-04	4.01E-04	3.70E-04	3.43E-04	2.48E-04	1.90E-04	1.53E-04	1.27E-04	1.08E-04	9.35E-05
	SD-ann100-all-1500u	5.92E-04	4.49E-04	3.51E-04	2.82E-04	2.32E-04	1.95E-04	1.67E-04	1.44E-04	1.27E-04	1.12E-04	1.00E-04	9.02E-05	8.17E-05	7.47E-05	6.84E-05	6.30E-05	5.83E-05	4.18E-05	3.18E-05	2.55E-05	2.10E-05	1.77E-05	1.52E-05
20	SD-ann200-all-1500d	7.33E-03	5.42E-03	4.18E-03	3.34E-03	2.73E-03	2.29E-03	1.95E-03	1.69E-03	1.48E-03	1.31E-03	1.17E-03	1.06E-03	9.58E-04	8.74E-04	8.03E-04	7.41E-04	6.87E-04	4.95E-04	3.81E-04	3.06E-04	2.54E-04	2.16E-04	1.87E-04
	SD-ann200-all-1500u	1.18E-03	8.97E-04	7.01E-04	5.64E-04	4.65E-04	3.90E-04	3.34E-04	2.89E-04	2.53E-04	2.24E-04	2.00E-04	1.80E-04	1.63E-04	1.49E-04	1.37E-04	1.26E-04	1.17E-04	8.36E-05	6.37E-05	5.09E-05	4.20E-05	3.54E-05	3.04E-05
21	SD-ann500-all-1500d	1.83E-02	1.36E-02	1.05E-02	8.34E-03	6.84E-03	5.72E-03	4.88E-03	4.22E-03	3.70E-03	3.28E-03	2.93E-03	2.64E-03	2.39E-03	2.19E-03	2.01E-03	1.85E-03	1.72E-03	1.24E-03	9.52E-04	7.65E-04	6.35E-04	5.40E-04	4.67E-04
	SD-ann500-all-1500u	2.96E-03	2.24E-03	1.75E-03	1.41E-03	1.16E-03	9.76E-04	8.34E-04	7.22E-04	6.33E-04	5.61E-04	5.01E-04	4.51E-04	4.09E-04	3.73E-04	3.42E-04	3.15E-04	2.92E-04	2.09E-04	1.59E-04	1.27E-04	1.05E-04	8.85E-05	7.59E-05
22	SD-ann1000-all-1500d	3.66E-02	2.71E-02	2.09E-02	1.67E-02	1.37E-02	1.14E-02	9.76E-03	8.44E-03	7.40E-03	6.55E-03	5.86E-03	5.28E-03	4.79E-03	4.37E-03	4.01E-03	3.70E-03	3.43E-03	2.48E-03	1.90E-03	1.53E-03	1.27E-03	1.08E-03	9.35E-04
	SD-ann1000-all-1500u	5.92E-03	4.49E-03	3.51E-03	2.82E-03	2.32E-03	1.95E-03	1.67E-03	1.44E-03	1.27E-03	1.12E-03	1.00E-03	9.02E-04	8.17E-04	7.47E-04	6.84E-04	6.30E-04	5.83E-04	4.18E-04	3.18E-04	2.55E-04	2.10E-04	1.77E-04	1.52E-04
23	SD-ann-50-sum-500d	5.32E-04	3.49E-04	2.48E-04	1.86E-04	1.45E-04	1.16E-04	9.59E-05	8.07E-05	6.91E-05	5.99E-05	5.27E-05	4.68E-05	4.20E-05	3.79E-05	3.45E-05	3.17E-05	2.92E-05	2.08E-05	1.61E-05	1.31E-05	1.11E-05	9.54E-06	8.39E-06
	SD-ann-50-sum-500u	6.87E-07	4.58E-07	3.05E-07	2.29E-07	1.53E-07	1.53E-07	7.63E-08	7.63E-08	7.63E-08	7.63E-08	7.63E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
24	SD-ann-100-sum-500d	1.06E-03	6.99E-04	4.96E-04	3.71E-04	2.89E-04	2.33E-04	1.92E-04	1.61E-04	1.38E-04	1.20E-04	1.05E-04	9.36E-05	8.39E-05	7.59E-05	6.90E-05	6.33E-05	5.83E-05	4.17E-05	3.22E-05	2.63E-05	2.21E-05	1.91E-05	1.68E-05
	SD-ann-100-sum-500u	1.37E-06	9.16E-07	6.10E-07	4.58E-07	3.05E-07	3.05E-07	1.53E-07	1.53E-07	1.53E-07	1.53E-07	1.53E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
25	SD-ann-200-sum-500d	2.13E-03	1.40E-03	9.91E-04	7.43E-04	5.79E-04	4.66E-04	3.84E-04	3.23E-04	2.76E-04	2.40E-04	2.11E-04	1.87E-04	1.68E-04	1.52E-04	1.38E-04	1.27E-04	1.17E-04	8.33E-05	6.44E-05	5.25E-05	4.43E-05	3.82E-05	3.36E-05
	SD-ann-200-sum-500u	2.75E-06	1.83E-06	1.22E-06	9.16E-07	6.10E-07	6.10E-07	3.05E-07	3.05E-07	3.05E-07	3.05E-07	3.05E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
26	SD-ann-500-sum-500d	1.59E-02	1.05E-02	7.42E-03	5.55E-03	4.33E-03	3.48E-03	2.87E-03	2.41E-03	2.07E-03	1.79E-03	1.58E-03	1.40E-03	1.26E-03	1.13E-03	1.03E-03	9.47E-04	8.72E-04	6.23E-04	4.82E-04	3.93E-04	3.31E-04	2.85E-04	2.51E-04
	SD-ann-500-sum-500u	2.05E-05	1.37E-05	9.13E-06	6.85E-06	4.57E-06	4.57E-06	2.28E-06	2.28E-06	2.28E-06	2.28E-06	2.28E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
27	SD-ann-50-sum-1500d	4.86E-04	3.22E-04	2.30E-04	1.73E-04	1.36E-04	1.09E-04	9.03E-05	7.60E-05	6.52E-05	5.66E-05	4.98E-05	4.43E-05	3.97E-05	3.59E-05	3.27E-05	3.00E-05	2.77E-05	1.98E-05	1.53E-05	1.24E-05	1.05E-05	9.08E-06	8.01E-06
	SD-ann-50-sum-1500u	6.87E-07	3.82E-07	3.05E-07	2.29E-07	1.53E-07	7.63E-08	7.63E-08	7.63E-08	7.63E-08	7.63E-08	7.63E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
28	SD-ann-100-sum-1500d	9.72E-04	6.45E-04	4.61E-04	3.47E-04	2.71E-04	2.19E-04	1.81E-04	1.52E-04	1.30E-04	1.13E-04	9.95E-05	8.85E-05	7.94E-05	7.19E-05	6.55E-05	6.00E-05	5.54E-05	3.95E-05	3.07E-05	2.49E-05	2.11E-05	1.82E-05	1.60E-05
	SD-ann-100-sum-1500u	1.37E-06	7.63E-07	6.10E-07	4.58E-07	3.05E-07	1.53E-07	1.53E-07	1.53E-07	1.53E-07	1.53E-07	1.53E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
29	SD-ann-200-sum-1500d	1.94E-03	1.29E-03	9.22E-04	6.93E-04	5.42E-04	4.37E-04	3.61E-04	3.04E-04	2.61E-04	2.26E-04	1.99E-04	1.77E-04	1.59E-04	1.44E-04	1.31E-04	1.20E-04	1.11E-04	7.91E-05	6.14E-05	4.98E-05	4.21E-05	3.63E-05	3.21E-05
	SD-ann-200-sum-1500u	2.75E-06	1.53E-06	1.22E-06	9.16E-07	6.10E-07	3.05E-07	3.05E-07	3.05E-07	3.05E-07	3.05E-07	3.05E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
30	SD-ann-500-sum-1500d	1.45E-02	9.65E-03	6.89E-03	5.18E-03	4.05E-03	3.27E-03	2.70E-03	2.27E-03	1.95E-03	1.69E-03	1.49E-03	1.32E-03	1.19E-03	1.08E-03	9.79E-04	8.97E-04	8.29E-04	5.91E-04	4.59E-04	3.72E-04	3.15E-04	2.72E-04	2.40E-04
	SD-ann-500-sum-1500u	2.05E-05	1.14E-05	9.13E-06	6.85E-06	4.57E-06	2.28E-06	2.28E-06	2.28E-06	2.28E-06	2.28E-06	2.28E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
31	SD-ann-50-bus-500d	2.03E-03	1.39E-03	1.01E-03	7.79E-04	6.21E-04	5.09E-04	4.28E-04	3.66E-04	3.18E-04	2.80E-04	2.49E-04	2.24E-04	2.03E-04	1.85E-04	1.70E-04	1.57E-04	1.45E-04	1.06E-04	8.25E-05	6.74E-05	5.66E-05	4.89E-05	4.28E-05
	SD-ann-50-bus-500u	1.49E-04	1.01E-04	7.41E-05	5.70E-05	4.53E-05	3.72E-05	3.13E-05	2.67E-05	2.32E-05	2.04E-05	1.82E-05	1.63E-05	1.47E-05	1.35E-05	1.23E-05	1.14E-05	1.06E-05	7.65E-06	5.94E-06	4.91E-06	4.11E-06	3.54E-06	3.08E-06
32	SD-ann-100-bus-500d	4.06E-03	2.77E-03	2.03E-03	1.56E-03	1.24E-03	1.02E-03	8.56E-04	7.32E-04	6.36E-04	5.60E-04	4.98E-04	4.48E-04	4.05E-04	3.70E-04	3.39E-04	3.13E-04	2.91E-04	2.12E-04	1.65E-04	1.35E-04	1.13E-04	9.77E-05	8.56E-05
	SD-ann-100-bus-500u	2.97E-04	2.03E-04	1.48E-04	1.14E-04	9.06E-05	7.44E-05	6.26E-05	5.34E-05	4.63E-05	4.09E-05	3.63E-05	3.26E-05	2.95E-05	2.69E-05	2.47E-05	2.28E-05	2.12E-05	1.53E-05	1.19E-05	9.82E-06	8.22E-06	7.08E-06	6.16E-06
33	SD-ann-200-bus-500d	8.12E-03	5.54E-03	4.05E-03	3.12E-03	2.48E-03	2.04E-03	1.71E-03	1.46E-03	1.27E-03	1.12E-03	9.96E-04	8.95E-04	8.11E-04	7.40E-04	6.79E-04	6.27E-04	5.82E-04	4.23E-04	3.30E-04	2.69E-04	2.26E-04	1.95E-04	1.71E-04
	SD-ann-200-bus-500u	5.95E-04	4.05E-04	2.96E-04	2.28E-04	1.81E-04	1.49E-04	1.25E-04	1.07E-04	9.27E-05	8.17E-05	7.26E-05	6.53E-05	5.89E-05	5.39E-05	4.93E-05	4.57E-05	4.25E-05	3.06E-05	2.37E-05	1.96E-05	1.64E-05	1.42E-05	1.23E-05
34	SD-ann-500-bus-500d	2.03E-02	1.39E-02	1.01E-02	7.79E-03	6.21E-03	5.09E-03	4.28E-03	3.66E-03	3.18E-03	2.80E-03	2.49E-03	2.24E-03	2.03E-03	1.85E-03	1.70E-03	1.57E-03	1.45E-03	1.06E-03	8.25E-04	6.74E-04	5.66E-04	4.89E-04	4.28E-04
	SD-ann-500-bus-500u	1.49E-03	1.01E-03	7.41E-04	5.70E-04	4.53E-04	3.72E-04	3.13E-04	2.67E-04	2.32E-04	2.04E-04	1.82E-04	1.63E-04	1.47E-04	1.35E-04	1.23E-04	1.14E-04	1.06E-04	7.65E-05	5.94E-05	4.91E-05	4.11E-05	3.54E-05	3.08E-05
35	SD-ann-1000-bus-500d	4.06E-02	2.77E-02	2.03E-02	1.56E-02	1.24E-02	1.02E-02	8.56E-03	7.32E-03	6.36E-03	5.60E-03	4.98E-03	4.48E-03	4.05E-03	3.70E-03	3.39E-03	3.13E-03	2.91E-03	2.12E-03	1.65E-03	1.35E-03	1.13E-03	9.77E-04	8.56E-04
	SD-ann-1000-bus-500u	2.97E-03	2.03E-03	1.48E-03	1.14E-03	9.06E-04	7.44E-04	6.26E-04	5.34E-04	4.63E-04	4.09E-04	3.63E-04	3.26E-04	2.95E-04	2.69E-04	2.47E-04	2.28E-04	2.12E-04	1.53E-04	1.19E-04	9.82E-05	8.22E-05	7.08E-05	6.16E-05
36	SD-ann-50-bus-1500d	1.72E-03	1.20E-03	8.96E-04	6.97E-04	5.61E-04	4.64E-04	3.92E-04	3.37E-04	2.93E-04	2.59E-04	2.31E-04	2.08E-04	1.89E-04	1.73E-04	1.59E-04	1.47E-04	1.36E-04	9.97E-05	7.80E-05	6.37E-05	5.38E-05	4.63E-05	4.08E-05
	SD-ann-50-bus-1500u	1.23E-04	8.66E-05	6.47E-05	5.06E-05	4.08E-05	3.37E-05	2.84E-05	2.44E-05	2.13E-05	1.88E-05	1.68E-05	1.52E-05	1.37E-05	1.26E-05	1.15E-05	1.06E-05	9.93E-06	7.19E-06	5.71E-06	4.57E-06	3.88E-06	3.31E-06	2.97E-06
37	SD-ann-100-bus-1500d	3.44E-03	2.41E-03	1.79E-03	1.39E-03	1.12E-03	9.27E-04	7.83E-04	6.73E-04	5.87E-04	5.18E-04	4.63E-04	4.16E-04	3.78E-04	3.45E-04	3.18E-04	2.94E-04	2.73E-04	1.99E-04	1.56E-04	1.27E-04	1.08E-04	9.27E-05	8.15E-05
	SD-ann-100-bus-1500u	2.45E-04	1.73E-04	1.29E-04	1.01E-04	8.15E-05	6.74E-05	5.68E-05	4.89E-05	4.27E-05	3.77E-05	3.36E-05	3.04E-05	2.74E-05	2.51E-05	2.31E-05	2.12E-05	1.99E-05	1.44E-05	1.14E-05	9.13E-06	7.76E-06	6.62E-06	5.94E-06
38	SD-ann-200-bus-1500d	6.89E-03	4.82E-03	3.59E-03	2.79E-03	2.24E-03	1.85E-03	1.57E-03	1.35E-03	1.17E-03	1.04E-03	9.25E-04	8.33E-04	7.56E-04	6.91E-04	6.35E-04	5.87E-04	5.45E-04	3.99E-04	3.12E-04	2.55E-04	2.15E-04	1.85E-04	1.63E-04
	SD-ann-200-bus-1500u	4.91E-04	3.47E-04	2.59E-04	2.02E-04	1.63E-04	1.35E-04	1.14E-04	9.77E-05	8.54E-05	7.53E-05	6.71E-05	6.07E-05	5.48E-05	5.02E-05	4.61E-05	4.25E-05	3.97E-05	2.88E-05	2.28E-05	1.83E-05	1.55E-05	1.32E-05	1.19E-05
39	SD-ann-500-bus-1500d	1.72E-02	1.20E-02	8.96E-03	6.97E-03	5.61E-03	4.64E-03	3.92E-03	3.37E-03	2.93E-03	2.59E-03	2.31E-03	2.08E-03	1.89E-03	1.73E-03	1.59E-03	1.47E-03	1.36E-03	9.97E-04	7.80E-04	6.37E-04	5.38E-04	4.63E-04	4.08E-04
	SD-ann-500-bus-1500u	1.23E-03	8.66E-04	6.47E-04	5.06E-04	4.08E-04	3.37E-04	2.84E-04	2.44E-04	2.13E-04	1.88E-04	1.68E-04	1.52E-04	1.37E-04	1.26E-04	1.15E-04	1.06E-04	9.93E-05	7.19E-05	5.71E-05	4.57E-05	3.88E-05	3.31E-05	2.97E-05
40	SD-ann-1000-bus-1500d	3.44E-02	2.41E-02	1.79E-02	1.39E-02	1.12E-02	9.27E-03	7.83E-03	6.73E-03	5.87E-03	5.18E-03	4.63E-03	4.16E-03	3.78E-03	3.45E-03	3.18E-03	2.94E-03	2.73E-03	1.99E-03	1.56E-03	1.27E-03	1.08E-03	9.27E-04	8.15E-04
	SD-ann-1000-bus-1500u	2.45E-03	1.73E-03	1.29E-03	1.01E-03	8.15E-04	6.74E-04	5.68E-04	4.89E-04	4.27E-04	3.77E-04	3.36E-04	3.04E-04	2.74E-04	2.51E-04	2.31E-04	2.12E-04	1.99E-04	1.44E-04	1.14E-04	9.13E-05	7.76E-05	6.62E-05	5.94E-05

Table SD2: Acrolein 1-Hour Hazard Index for San Diego

concentrations in micrograms/m^3 Acrolein MRL 0.19 ug/m3

Model Run number	Name	Engine Size (hp)	Hours of run time per year	Model outputs	Scenario	Max	Distance Downwind (meters)									
							14	28	42	57	71	85	99	113	127	141
1	SD-1H-all-500	500	8760	max 1-hour	all	0.15	0.06	0.10	0.12	0.15	0.14	0.13	0.11	0.10	0.09	0.08
2	SD-1H-all-1500	1500	8760	max 1-hour	all	0.01	0.00	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.00
3	SD-1H-sum-500	500	732	max 1-hour	summer	0.10	0.04	0.10	0.10	0.09	0.08	0.07	0.06	0.05	0.05	0.04
4	SD-1H-sum-1500	1500	732	max 1-hour	summer	0.01	0.00	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.00
5	SD-1H-bus-500	500	4380	max 1-hour	business	0.15	0.06	0.10	0.12	0.15	0.14	0.13	0.11	0.10	0.09	0.08
6	SD-1H-bus-1500	1500	4380	max 1-hour	business	0.01	0.00	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.00

Model Run	Name	184	198	212	226	240	255	269	283	424	566	707	849	990	1131	1273
1	SD-1H-all-500	0.06	0.06	0.05	0.05	0.05	0.04	0.04	0.04	0.03	0.02	0.02	0.01	0.01	0.01	0.01
2	SD-1H-all-1500	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3	SD-1H-sum-500	0.03	0.03	0.02	0.02	0.02	0.02	0.02	0.01	0.01	0.01	0.01	0.01	0.00	0.00	0.00
4	SD-1H-sum-1500	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5	SD-1H-bus-500	0.06	0.06	0.05	0.05	0.05	0.04	0.04	0.04	0.03	0.02	0.02	0.01	0.01	0.01	0.01
6	SD-1H-bus-1500	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Model Run	Name	1697	1838	1980	2121	2263	2404	2546	2687	2828	3536	4243	4950	5657	6364	7071
1	SD-1H-all-500	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00
2	SD-1H-all-1500	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3	SD-1H-sum-500	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4	SD-1H-sum-1500	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5	SD-1H-bus-500	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00
6	SD-1H-bus-1500	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Table SD3: 24-Hour PM Concentrations as Percent of CalEPA 24-Hour Standard for San Diego

concentrations in microgram 24 Hour Standard 50 ug/m3

Model Run number	Name	Engine Size (hp)	Hours of run time per year	Model outputs	Scenario	Max	Distance Downwind (meters)										
							14	28	42	57	71	85	99	113	127	141	156
7	SD-24H-all-500	500	8760	24-hour	all	57.99%	8.56%	43.11%	49.59%	57.99%	53.37%	45.62%	38.24%	32.00%	26.94%	22.87%	19.59%
8	SD-24H-all-1500	1500	8760	24-hour	all	14.89%	0.07%	4.20%	11.04%	14.89%	14.69%	13.09%	14.40%	14.54%	14.01%	13.14%	12.15%
9	SD-H-sum-500	500	732	24-hour	summer	21.93%	3.35%	18.89%	21.93%	20.25%	16.60%	13.81%	11.40%	9.46%	7.92%	6.71%	5.75%
10	SD-24H-sum-1500	1500	732	24-hour	summer	6.06%	0.01%	1.33%	3.86%	5.43%	5.97%	6.06%	5.73%	5.24%	4.70%	4.18%	3.77%
11	SD-24H-bus-500	500	4380	24-hour	business	39.83%	8.32%	35.39%	39.83%	37.73%	33.30%	27.92%	23.19%	19.31%	16.22%	13.75%	11.77%
12	SD-24H-bus-1500	1500	4380	24-hour	business	11.67%	0.07%	4.05%	8.75%	11.55%	11.67%	11.06%	10.52%	9.56%	8.92%	8.22%	7.51%

Model Run	Name	170	184	198	212	226	240	255	269	283	424	566	707	849	990	1131	1273
7	SD-24H-all-500	16.93%	14.76%	12.97%	11.55%	10.45%	9.98%	9.60%	9.23%	8.87%	6.14%	4.36%	3.24%	2.51%	2.01%	1.65%	1.39%
8	SD-24H-all-1500	11.16%	10.22%	9.34%	8.54%	7.82%	7.18%	6.60%	6.08%	5.61%	4.03%	3.14%	2.49%	2.02%	1.66%	1.40%	1.19%
9	SD-H-sum-500	4.97%	4.34%	3.81%	3.38%	3.01%	2.70%	2.43%	2.21%	2.01%	0.96%	0.64%	0.46%	0.35%	0.28%	0.23%	0.19%
10	SD-24H-sum-1500	3.42%	3.10%	2.82%	2.56%	2.34%	2.14%	1.96%	1.80%	1.66%	0.84%	0.51%	0.38%	0.30%	0.24%	0.20%	0.17%
11	SD-24H-bus-500	10.18%	8.87%	7.80%	6.90%	6.23%	5.80%	5.47%	5.18%	4.91%	3.13%	2.38%	1.93%	1.63%	1.41%	1.25%	1.12%
12	SD-24H-bus-1500	6.84%	6.23%	5.67%	5.17%	4.73%	4.33%	3.98%	3.66%	3.38%	2.19%	1.61%	1.25%	1.04%	0.87%	0.74%	0.65%

Model Run	Name	1414	1556	1697	1838	1980	2121	2263	2404	2546	2687	2828	3536	4243	4950	5657	6364	7071
7	SD-24H-all-500	1.18%	1.03%	0.90%	0.80%	0.75%	0.70%	0.66%	0.63%	0.60%	0.57%	0.54%	0.44%	0.37%	0.33%	0.29%	0.26%	0.23%
8	SD-24H-all-1500	1.03%	0.91%	0.80%	0.72%	0.65%	0.59%	0.54%	0.50%	0.46%	0.43%	0.40%	0.30%	0.24%	0.20%	0.17%	0.14%	0.13%
9	SD-H-sum-500	0.17%	0.15%	0.13%	0.12%	0.11%	0.10%	0.09%	0.08%	0.08%	0.07%	0.07%	0.05%	0.04%	0.04%	0.03%	0.03%	0.03%
10	SD-24H-sum-1500	0.15%	0.13%	0.12%	0.11%	0.10%	0.09%	0.08%	0.08%	0.07%	0.07%	0.06%	0.05%	0.04%	0.03%	0.03%	0.03%	0.02%
11	SD-24H-bus-500	1.02%	0.93%	0.86%	0.80%	0.75%	0.70%	0.66%	0.63%	0.60%	0.57%	0.54%	0.44%	0.37%	0.33%	0.29%	0.26%	0.23%
12	SD-24H-bus-1500	0.57%	0.50%	0.45%	0.41%	0.37%	0.34%	0.32%	0.29%	0.27%	0.25%	0.24%	0.18%	0.15%	0.12%	0.10%	0.09%	0.08%

Table SD4: Chronic Cancer Risk for San Diego

concentrations in micrograms/m^3

Model Run number	Name	Engine Size (hp)	Hours of run time per year	Model outputs	Scenario	Wind	Max	Distance Downwind (meters)																												
								14	28	42	57	71	85	99	113	127	141	156	170	184	198	212	226	240	255	269	283	424	566	707	849	990	1131	1273	1414	1556	1697	1838
1	SD-ann50-all-500d	500	50	annual	all	downwind	10.3	0.5	6.9	10.3	10.2	8.9	7.5	6.4	5.4	4.7	4.2	3.7	3.4	3.1	2.8	2.6	2.4	2.2	2.1	2.0	1.8	1.1	0.7	0.5	0.4	0.3	0.2	0.2	0.2	0.1	0.1	0.1
	SD-ann50-all-500u	500	50	annual	all	upwind	0.9	0.0	0.3	0.7	0.9	0.9	0.8	0.7	0.7	0.6	0.6	0.5	0.5	0.4	0.4	0.4	0.4	0.3	0.3	0.3	0.3	0.2	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
14	SD-ann100-all-500d	500	100	annual	all	downwind	20.6	0.9	13.8	20.6	20.3	17.8	15.0	12.7	10.9	9.5	8.4	7.5	6.7	6.1	5.6	5.2	4.8	4.5	4.2	3.9	3.7	2.1	1.4	1.0	0.7	0.6	0.5	0.4	0.3	0.3	0.2	0.2
	SD-ann100-all-500u	500	100	annual	all	upwind	1.8	0.0	0.5	1.3	1.7	1.8	1.7	1.5	1.3	1.2	1.1	1.0	1.0	0.9	0.8	0.8	0.7	0.7	0.6	0.6	0.6	0.4	0.2	0.2	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.0
15	SD-ann200-all-500d	500	200	annual	all	downwind	41.1	1.8	27.6	41.1	40.7	35.6	30.1	25.4	21.8	18.9	16.7	14.9	13.5	12.3	11.3	10.4	9.6	9.0	8.4	7.8	7.4	4.3	2.8	2.0	1.5	1.2	0.9	0.8	0.7	0.6	0.5	0.4
	SD-ann200-all-500u	500	200	annual	all	upwind	3.6	0.0	1.1	2.7	3.5	3.6	3.3	3.0	2.7	2.4	2.2	2.1	1.9	1.8	1.7	1.5	1.5	1.4	1.3	1.2	1.2	0.7	0.5	0.3	0.3	0.2	0.2	0.1	0.1	0.1	0.1	0.1
16	SD-ann500-all-500d	500	500	annual	all	downwind	102.8	4.6	69.0	102.8	101.7	88.9	75.2	63.5	54.4	47.3	41.8	37.4	33.7	30.7	28.2	26.0	24.1	22.4	20.9	19.6	18.4	10.7	7.0	5.0	3.7	2.9	2.3	1.9	1.6	1.4	1.2	1.1
	SD-ann500-all-500u	500	500	annual	all	upwind	8.9	0.1	2.7	6.6	8.7	8.9	8.3	7.5	6.7	6.1	5.6	5.1	4.8	4.4	4.1	3.9	3.6	3.4	3.2	3.0	2.9	1.8	1.2	0.8	0.6	0.5	0.4	0.3	0.3	0.2	0.2	0.2
17	SD-ann1000-all-500d	500	1000	annual	all	downwind	205.5	9.2	138.0	205.5	203.4	177.9	150.3	127.0	108.8	94.7	83.5	74.7	67.5	61.5	56.4	52.0	48.2	44.9	41.9	39.2	36.8	21.4	14.0	9.9	7.4	5.8	4.7	3.9	3.3	2.8	2.5	2.2
	SD-ann1000-all-500u	500	1000	annual	all	upwind	17.8	0.1	5.4	13.3	17.4	17.8	16.5	15.0	13.5	12.2	11.2	10.3	9.5	8.8	8.3	7.7	7.3	6.8	6.4	6.1	5.8	3.5	2.4	1.7	1.3	1.0	0.8	0.7	0.6	0.5	0.4	0.4
18	SD-ann50-all-1500d	1500	50	annual	all	downwind	2.7	0.0	0.1	1.0	1.9	2.5	2.7	2.7	2.6	2.4	2.3	2.1	2.0	1.8	1.7	1.6	1.5	1.4	1.3	1.3	1.2	0.8	0.5	0.4	0.3	0.3	0.2	0.2	0.1	0.1	0.1	0.1
	SD-ann50-all-1500u	1500	50	annual	all	upwind	0.2	0.0	0.0	0.0	0.1	0.1	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
19	SD-ann100-all-1500d	1500	100	annual	all	downwind	5.4	0.0	0.3	1.9	3.9	5.0	5.4	5.3	5.1	4.8	4.5	4.2	3.9	3.6	3.4	3.2	3.0	2.8	2.7	2.6	2.4	1.6	1.1	0.8	0.6	0.5	0.4	0.3	0.3	0.3	0.2	0.2
	SD-ann100-all-1500u	1500	100	annual	all	upwind	0.5	0.0	0.0	0.0	0.1	0.3	0.3	0.4	0.4	0.5	0.5	0.5	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.3	0.2	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.0
20	SD-ann200-all-1500d	1500	200	annual	all	downwind	10.7	0.0	0.6	3.9	7.7	9.9	10.7	10.7	10.2	9.6	9.0	8.4	7.8	7.3	6.8	6.4	6.0	5.7	5.4	5.1	4.9	3.1	2.2	1.6	1.3	1.0	0.8	0.7	0.6	0.5	0.4	0.4
	SD-ann200-all-1500u	1500	200	annual	all	upwind	0.9	0.0	0.0	0.1	0.3	0.5	0.7	0.8	0.9	0.9	0.9	0.9	0.9	0.9	0.8	0.8	0.8	0.8	0.7	0.7	0.7	0.5	0.4	0.3	0.2	0.2	0.1	0.1	0.1	0.1	0.1	0.1
21	SD-ann500-all-1500d	1500	500	annual	all	downwind	26.8	0.0	1.4	9.7	19.3	24.8	26.8	26.7	25.6	24.1	22.5	21.0	19.5	18.2	17.1	16.0	15.1	14.2	13.5	12.8	12.2	7.8	5.5	4.1	3.1	2.5	2.1	1.7	1.5	1.3	1.1	1.0
	SD-ann500-all-1500u	1500	500	annual	all	upwind	2.3	0.0	0.0	0.2	0.7	1.3	1.7	2.0	2.2	2.3	2.3	2.3	2.2	2.2	2.1	2.0	2.0	1.9	1.8	1.8	1.7	1.2	0.9	0.7	0.5	0.4	0.3	0.3	0.3	0.2	0.2	0.2
22	SD-ann1000-all-1500d	1500	1000	annual	all	downwind	53.5	0.0	2.8	19.3	38.6	49.6	53.5	53.4	51.2	48.2	45.0	42.0	39.1	36.5	34.1	32.0	30.2	28.5	27.0	25.6	24.3	15.7	11.0	8.1	6.3	5.0	4.1	3.4	2.9	2.5	2.2	2.0
	SD-ann1000-all-1500u	1500	1000	annual	all	upwind	4.6	0.0	0.0	0.5	1.5	2.6	3.4	4.0	4.4	4.5	4.6	4.5	4.4	4.3	4.2	4.0	3.9	3.8	3.6	3.5	3.4	2.4	1.8	1.3	1.1	0.8	0.7	0.6	0.5	0.4	0.4	0.3
23	SD-ann-50-sum-500d	500	50	annual	summer	downwind	7.8	0.4	5.8	7.8	7.0	5.7	4.5	3.6	2.9	2.4	2.0	1.7	1.5	1.3	1.1	1.0	0.9	0.8	0.7	0.6	0.6	0.3	0.2	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0
	SD-ann-50-sum-500u	500	50	annual	summer	upwind	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
24	SD-ann-100-sum-500d	500	100	annual	summer	downwind	15.7	0.9	11.6	15.7	14.1	11.4	9.0	7.2	5.9	4.8	4.1	3.4	3.0	2.6	2.2	2.0	1.8	1.6	1.4	1.3	1.2	0.5	0.3	0.2	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.0
	SD-ann-100-sum-500u	500	100	annual	summer	upwind	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
25	SD-ann-200-sum-500d	500	200	annual	summer	downwind	31.3	1.8	23.1	31.3	28.1	22.8	18.1	14.5	11.8	9.7	8.1	6.9	5.9	5.1	4.5	4.0	3.5	3.2	2.8	2.6	2.3	1.1	0.6	0.4	0.3	0.2	0.2	0.1	0.1	0.1	0.1	0.1
	SD-ann-200-sum-500u	500	200	annual	summer	upwind	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
26	SD-ann-500-sum-500d	500	500	annual	summer	downwind	234.1	13.1	172.9	234.1	210.3	170.2	135.4	108.4	88.0	72.5	60.7	51.4	44.1	38.3	33.5	29.6	26.3	23.6	21.2	19.2	17.5	8.2	4.8	3.1	2.2	1.7	1.3	1.0	0.9	0.7	0.6	0.5
	SD-ann-500-sum-500u	500	500	annual	summer	upwind	0.3	0.0	0.1	0.2	0.3	0.2	0.2	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
28	SD-ann-50-sum-1500d	1500	50	annual	summer	downwind	2.1	0.0	0.1	0.9	1.7	2.0	2.1	2.0	1.8	1.6	1.4	1.2	1.1	1.0	0.9	0.8	0.7	0.7	0.6	0.5	0.5	0.2	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0
	SD-ann-50-sum-1500u	1500	50	annual	summer	upwind	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
29	SD-ann-100-sum-1500d	1500	100	annual	summer	downwind	4.1	0.0	0.3	1.7	3.3	4.1	4.1	3.9	3.6	3.2	2.8	2.5	2.2	2.0	1.8	1.6	1.4	1.3	1.2	1.1	1.0	0.5	0.3	0.2	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.0
	SD-ann-100-sum-1500u	1500	100	annual	summer	upwind	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
30	SD-ann-200-sum-1500d	1500	200	annual	summer	downwind	8.3	0.0	0.5	3.5	6.6	8.1	8.3	7.8	7.1	6.3	5.6	5.0	4.4	4.0	3.5	3.2	2.9	2.6	2.4	2.2	2.0	1.0	0.6	0.4	0.3	0.2	0.2	0.1	0.1	0.1	0.1	0.1
	SD-ann-200-sum-1500u	1500	200	annual	summer	upwind	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
31	SD-ann-500-sum-1500d	1500	500	annual	summer	downwind	61.9	0.0	4.1	26.1	49.6	60.6	61.9	58.4	53.1	47.5	42.1	37.4	33.2	29.6	26.5	23.9	21.6	19.6	17.8	16.3	14.9	7.3	4.4	2.9	2.1	1.6	1.2	1.0	0.8	0.7	0.6	0.5
	SD-ann-500-sum-1500u	1500	500	annual	summer	upwind	0.1	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
31	SD-ann-50-bus-500d	500	50	annual	business	downwind	18.6	0.9	13.2	18.6	17.3	14.4	11.7	9.6	7.9	6.6	5.7	4.9	4.3	3.8	3.4	3.0	2.7	2.5	2.3	2.1	1.9	1.0	0.6	0.4	0.3	0.2	0.2	0.2	0.1	0.1	0.1	0.1
	SD-ann-50-bus-500u	500	50	annual	business	upwind	0.8	0.0	0.3	0.6	0.8	0.8	0.7	0.6	0.5	0.4	0.4	0.3	0.3	0.3	0.2	0.2	0.2	0.2	0.2	0.2	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
32	SD-ann-100-bus-500d	500	100	annual	business	downwind	37.2	1.8	26.4	37.2	34.6	28.8	23.4	19.1	15.8	13.3	11.3	9.8	8.6	7.6	6.7	6.0	5.5	5.0	4.5	4.2	3.8	2.0	1.2	0.8	0.6	0.5	0.4	0.3	0.3	0.2	0.2	0.2
	SD-ann-100-bus-500u	500	100	annual	business	upwind	1.5	0.0	0.6	1.3	1.5	1.5	1.4	1.2	1.0	0.9	0.8	0.7	0.6	0.5	0.5	0.4	0.4	0.4	0.3	0.3	0.3	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
33	SD-ann-200-bus-500d	500	200	annual	business	downwind	74.4	3.7	52.8	74.4	69.2	57.7	46.9	38.3	31.6	26.6	22.6	19.6	17.1	15.1	13.5	12.1	10.9	9.9	9.1	8.3	7.7	4.0	2.4	1.7	1.2	0.9	0.7	0.6	0.5	0.4	0.4	0.3
	SD-ann-200-bus-500u	500	200	annual	business	upwind	3.1	0.0	1.2	2.5	3.1	3.0	2.7	2.4	2.1	1.8	1.6	1.4	1.2	1.1	1.0	0.9	0.8	0.7	0.7	0.6	0.6	0.3	0.2	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0
34	SD-ann-500-bus-500d	500	500	annual	business	downwind	186.0	9.2	132.1	186.0	173.0	144.2	117.2	95.7	79.1	66.4	56.6	48.9	42.8	37.8	33.6	30.2	27.3	24.8	22.7	20.8	19.2	9.9	6.1	4.2	3.0	2.3	1.9	1.5	1.3	1.1	1.0	0.8
	SD-ann-500-bus-500u	500	500	annual	business	upwind	7.7	0.1	3.0	6.3	7.7	7.5	6.8	5.9	5.1	4.5	3.9	3.4	3.0	2.7	2.4	2.2	2.0	1.8	1.7	1.5	1.4	0.7	0.4	0.3	0.2	0.2	0.1	0.1	0.1	0.1	0.1	0.1
35	SD-ann-1000-bus-500d	500	1000	annual	business	downwind	371.9	18.3	264.2	371.9	346.1	288.3	234.5	191.3	158.2	132.8	113.2	97.8	85.5	75.5	67.3	60.4	54.6	49.6	45.3	41.6	38.3	19.8	12.2	8.3	6.1	4.7	3.7	3.1	2.6	2.2	1.9	1.7
	SD-ann-1000-bus-500u	500	1000	annual	business	upwind	15.3	0.2	5.9	12.6	15.3	15.0	13.5	11.8	10.3	8.9	7.8	6.9	6.1	5.4	4.9	4.4	4.0	3.6	3.3	3.0	2.8	1.5	0.9	0.6	0.4	0.3	0.3	0.2	0.2	0.2	0.1	0.1
36	SD-ann-50-bus-1500d	1500	50	annual	business	downwind	4.8	0.0	0.3	1.9	3.7	4.6	4.8	4.7	4.3	3.9	3.6	3.2	2.9	2.6	2.4	2.2	2.0	1.8	1.7	1.6	1.5	0.8	0.5	0.4	0.3	0.2	0.2	0.1	0.1	0.1	0.1	0.1
	SD-ann-50-bus-1500u	1500	50	annual	business	upwind	0.2	0.0	0.0	0.0	0.1	0.1	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
37	SD-ann-100-bus-1500d	1500	100	annual	business	downwind	9.7	0.0	0.6	3.8	7.4	9.3	9.7	9.3	8.6	7.9	7.1	6.4	5.8	5.3	4.8	4.4	4.0	3.7	3.4	3.2	2.9	1.6	1.0	0.7	0.5	0.4	0.3	0.3	0.2	0.2	0.2	0.2
	SD-ann-100-bus-1500u	1500	100	annual	business	upwind	0.4	0.0	0.0	0.1	0.2	0.3	0.3	0.4	0.4	0.4	0.4	0.3	0.3	0.3	0.3	0.3	0.2	0.2	0.2	0.2	0.2	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
38	SD-ann-200-bus-1500d	1500	200	annual	business	downwind	19.4	0.0	1.1	7.6	14.8	18.6	19.4	18.7	17.3	15.7	14.2	12.8	11.6	10.5	9.6	8.7	8.0	7.4	6.8	6.3	5.9	3.2	2.1	1.4	1.1	0.8	0.7	0.6	0.5	0.4	0.4	0.3
	SD-ann-200-bus-1500u	1500	200	annual	business	upwind	0.7	0.0	0.0	0.1	0.3	0.5	0.6	0.7	0.7	0.7	0.7	0.7	0.6	0.6	0.6	0.5	0.5	0.5	0.4	0.4	0.4	0.2	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0
39	SD-ann-500-bus-1500d	1500	500	annual	business	downwind	48.5	0.0	2.8	18.9	37.1	46.4	48.5	46.7	43.2	39.4	35.6	32.1	29.0	26.3	23.9	21.9	20.1	18.5	17.1	15.8	14.7	8.1	5.2	3.6	2.7	2.1	1.7	1.4	1.2	1.0	0.9	0.8
	SD-ann-500-bus-1500u	1500	500	annual	business	upwind	1.8	0.0	0.0	0.3	0.8	1.3	1.6	1.8	1.8	1.8	1.8	1.7	1.6	1.5	1.4	1.3	1.2	1.2	1.1	1.0	1.0	0.6	0.4	0.3	0.2	0.2	0.1	0.1	0.1	0.1	0.1	0.1
40	SD-ann-1000-bus-1500d	1500	1000	annual	business	downwind	96.9	0.0	5.5	37.8	74.2	92.8	96.9	93.3	86.5	78.7	71.1	64.2	58.0	52.6	47.9	43.7	40.1	36.9	34.1	31.6	29.4	16.2	10.3	7.2	5.4	4.2	3.4	2.8	2.3	2.0	1.8	1.6
	SD-ann-1000-bus-1500u	1500	1000	annual	business	upwind	3.7	0.0	0.0	0.6	1.6	2.5	3.2	3.6	3.7	3.7	3.6	3.4	3.2	3.0	2.8	2.7	2.5	2.3	2.2	2.1	1.9	1.1	0.7	0.5	0.4	0.3	0.2	0.2	0.2	0.1	0.1	0.1

Model Run number	Name	1980	2121	2263	2404	2546	2687	2828	3536	4243	4950	5657	6364	7071
1	SD-ann50-all-500d	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0
	SD-ann50-all-500u	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
14	SD-ann100-all-500d	0.2	0.2	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0
	SD-ann100-all-500u	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
15	SD-ann200-all-500d	0.4	0.3	0.3	0.3	0.3	0.2	0.2	0.2	0.1	0.1	0.1	0.1	0.1
	SD-ann200-all-500u	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
16	SD-ann500-all-500d	1.0	0.9	0.8	0.7	0.7	0.6	0.6	0.4	0.3	0.2	0.2	0.2	0.1
	SD-ann500-all-500u	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0
17	SD-ann1000-all-500d	1.9	1.7	1.6	1.4	1.3	1.2	1.1	0.8	0.6	0.5	0.4	0.3	0.3
	SD-ann1000-all-500u	0.3	0.3	0.3	0.2	0.2	0.2	0.2	0.1	0.1	0.1	0.1	0.1	0.0
18	SD-ann50-all-1500d	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0
	SD-ann50-all-1500u	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
19	SD-ann100-all-1500d	0.2	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0
	SD-ann100-all-1500u	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
20	SD-ann200-all-1500d	0.4	0.3	0.3	0.3	0.2	0.2	0.2	0.1	0.1	0.1	0.1	0.1	0.1
	SD-ann200-all-1500u	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
21	SD-ann500-all-1500d	0.9	0.8	0.7	0.7	0.6	0.6	0.5	0.4	0.3	0.2	0.2	0.2	0.1
	SD-ann500-all-1500u	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0
22	SD-ann1000-all-1500d	1.8	1.6	1.4	1.3	1.2	1.1	1.0	0.7	0.6	0.5	0.4	0.3	0.3
	SD-ann1000-all-1500u	0.3	0.3	0.2	0.2	0.2	0.2	0.2	0.1	0.1	0.1	0.1	0.1	0.0
23	SD-ann-50-sum-500d	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	SD-ann-50-sum-500u	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
24	SD-ann-100-sum-500d	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	SD-ann-100-sum-500u	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
25	SD-ann-200-sum-500d	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	SD-ann-200-sum-500u	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
26	SD-ann-500-sum-500d	0.5	0.4	0.4	0.3	0.3	0.3	0.3	0.2	0.1	0.1	0.1	0.1	0.1
	SD-ann-500-sum-500u	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
28	SD-ann-50-sum-1500d	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	SD-ann-50-sum-1500u	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
29	SD-ann-100-sum-1500d	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	SD-ann-100-sum-1500u	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
30	SD-ann-200-sum-1500d	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	SD-ann-200-sum-1500u	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
31	SD-ann-500-sum-1500d	0.4	0.4	0.4	0.3	0.3	0.3	0.2	0.2	0.1	0.1	0.1	0.1	0.1
	SD-ann-500-sum-1500u	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
31	SD-ann-50-bus-500d	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	SD-ann-50-bus-500u	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
32	SD-ann-100-bus-500d	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0
	SD-ann-100-bus-500u	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
33	SD-ann-200-bus-500d	0.3	0.3	0.2	0.2	0.2	0.2	0.2	0.1	0.1	0.1	0.1	0.1	0.1
	SD-ann-200-bus-500u	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
34	SD-ann-500-bus-500d	0.7	0.7	0.6	0.6	0.5	0.5	0.4	0.3	0.2	0.2	0.2	0.1	0.1
	SD-ann-500-bus-500u	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
35	SD-ann-1000-bus-500d	1.5	1.3	1.2	1.1	1.0	0.9	0.9	0.6	0.5	0.4	0.3	0.3	0.3
	SD-ann-1000-bus-500u	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0
36	SD-ann-50-bus-1500d	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	SD-ann-50-bus-1500u	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
37	SD-ann-100-bus-1500d	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0
	SD-ann-100-bus-1500u	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
38	SD-ann-200-bus-1500d	0.3	0.2	0.2	0.2	0.2	0.2	0.2	0.1	0.1	0.1	0.1	0.1	0.0
	SD-ann-200-bus-1500u	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
39	SD-ann-500-bus-1500d	0.7	0.6	0.6	0.5	0.5	0.4	0.4	0.3	0.2	0.2	0.2	0.1	0.1
	SD-ann-500-bus-1500u	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
40	SD-ann-1000-bus-1500d	1.4	1.2	1.1	1.0	1.0	0.9	0.8	0.6	0.5	0.4	0.3	0.3	0.2
	SD-ann-1000-bus-1500u	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0

Table FR1: Model Results for Fresno

concentrations in micrograms/m^3

Model	Name	Engine Size (hp)	PM Emissions (lb/hr)	Hours of run time per year	Model outputs	Scenario	Wind	Max	Distance Downwind (meters)*																	
									14	28	42	57	71	85	99	113	127	141	156	170	184	198	212	226	240	255
1	FR-1H-all-500	500	1.1	8760	max 1-hour	all		67.56	40.024	67.556	64.320	56.672	49.551	43.208	40.639	39.932	37.919	35.403	32.843	30.457	28.320	26.435	24.778	23.317	22.022	20.867
2	FR-1H-all-1500	1500	1.05	8760	max 1-hour	all		23.67	0.908	15.748	23.674	22.680	20.250	18.233	16.474	14.846	13.358	12.303	11.832	11.771	11.515	11.136	10.689	10.215	9.740	9.279
3	FR-1H-sum-500	500	1.1	732	max 1-hour	summer		67.56	24.095	67.556	64.320	56.672	49.551	43.208	38.165	34.291	30.475	26.932	24.152	21.803	19.676	17.781	16.105	14.628	13.327	12.180
4	FR-1H-sum-1500	1500	1.05	732	max 1-hour	summer		21.57	0.040	10.603	20.419	21.570	20.250	18.233	16.474	14.846	13.358	12.303	11.363	10.524	9.772	9.135	8.574	8.063	7.652	7.243
5	FR-1H-bus-500	500	1.1	4380	max 1-hour	business		67.56	40.024	67.556	64.320	56.672	49.551	43.208	40.639	39.932	37.919	35.403	32.843	30.457	28.320	26.435	24.778	23.317	22.022	20.867
6	FR-1H-bus-1500	1500	1.05	4380	max 1-hour	business		22.71	0.908	15.748	22.706	22.680	20.250	18.233	16.474	14.846	13.358	12.303	11.832	11.771	11.515	11.136	10.689	10.215	9.740	9.279
7	FR-24H-all-500	500	1.1	8760	24-hour	all		46.20	3.444	40.040	46.200	37.324	29.209	22.723	18.049	15.495	13.611	11.937	10.490	9.252	8.197	7.589	7.049	6.567	6.134	5.943
8	FR-24H-all-1500	1500	1.05	8760	24-hour	all		14.16	0.040	1.799	8.737	13.459	14.155	13.011	11.377	9.782	8.510	7.420	6.487	5.701	5.036	4.476	4.047	3.673	3.430	3.222
9	FR-H-sum-500	500	1.1	732	24-hour	summer		13.06	2.872	8.879	7.146	13.061	5.793	10.732	4.627	3.441	4.803	4.155	5.812	2.523	4.005	3.374	1.599	1.830	1.874	1.652
10	FR-24H-sum-1500	1500	1.05	732	24-hour	summer		3.65	1.992	3.646	3.441	2.135	1.378	3.312	1.394	1.377	2.751	1.292	3.059	1.781	2.491	2.230	0.966	0.976	1.433	1.291
11	FR-24H-bus-500	500	1.1	4380	24-hour	business		24.16	3.195	22.084	24.164	20.715	19.366	16.681	14.050	11.798	9.954	8.861	7.924	7.084	6.344	5.697	5.133	4.641	4.211	3.835
12	FR-24H-bus-1500	1500	1.05	4380	24-hour	business		7.01	0.040	1.586	5.188	7.015	6.943	6.548	5.940	5.240	5.047	4.763	4.423	4.075	3.740	3.427	3.141	2.880	2.646	2.435
13	FR-ann50-all-500d	500	1.1	50	annual	all	downwind	0.043	1.31E-03	2.72E-02	4.32E-02	4.28E-02	3.70E-02	3.10E-02	2.61E-02	2.24E-02	1.98E-02	1.77E-02	1.62E-02	1.49E-02	1.38E-02	1.29E-02	1.21E-02	1.13E-02	1.07E-02	1.01E-02
	FR-ann50-all-500u	500	1.1	50	annual	all	upwind	0.002	9.59E-06	3.58E-04	9.63E-04	1.38E-03	1.51E-03	1.52E-03	1.48E-03	1.44E-03	1.41E-03	1.38E-03	1.36E-03	1.33E-03	1.30E-03	1.27E-03	1.24E-03	1.21E-03	1.18E-03	1.14E-03
14	FR-ann100-all-500d	500	1.1	100	annual	all	downwind	0.086	2.62E-03	5.44E-02	8.64E-02	8.55E-02	7.40E-02	6.20E-02	5.22E-02	4.49E-02	3.95E-02	3.54E-02	3.23E-02	2.98E-02	2.76E-02	2.58E-02	2.41E-02	2.27E-02	2.13E-02	2.01E-02
	FR-ann100-all-500u	500	1.1	100	annual	all	upwind	0.003	1.92E-05	7.17E-04	1.93E-03	2.76E-03	3.03E-03	3.03E-03	2.96E-03	2.89E-03	2.83E-03	2.76E-03	2.71E-03	2.66E-03	2.60E-03	2.55E-03	2.49E-03	2.42E-03	2.36E-03	2.29E-03
15	FR-ann200-all-500d	500	1.1	200	annual	all	downwind	0.173	5.24E-03	1.09E-01	1.73E-01	1.71E-01	1.48E-01	1.24E-01	1.04E-01	8.98E-02	7.90E-02	7.09E-02	6.46E-02	5.95E-02	5.52E-02	5.15E-02	4.83E-02	4.53E-02	4.27E-02	4.03E-02
	FR-ann200-all-500u	500	1.1	200	annual	all	upwind	0.006	3.84E-05	1.43E-03	3.85E-03	5.51E-03	6.05E-03	6.06E-03	5.92E-03	5.77E-03	5.66E-03	5.53E-03	5.42E-03	5.32E-03	5.21E-03	5.09E-03	4.97E-03	4.84E-03	4.71E-03	4.57E-03
16	FR-ann500-all-500d	500	1.1	500	annual	all	downwind	0.432	1.31E-02	2.72E-01	4.32E-01	4.28E-01	3.70E-01	3.10E-01	2.61E-01	2.24E-01	1.98E-01	1.77E-01	1.62E-01	1.49E-01	1.38E-01	1.29E-01	1.21E-01	1.13E-01	1.07E-01	1.01E-01
	FR-ann500-all-500u	500	1.1	500	annual	all	upwind	0.015	9.59E-05	3.58E-03	9.63E-03	1.38E-02	1.51E-02	1.52E-02	1.48E-02	1.44E-02	1.41E-02	1.38E-02	1.36E-02	1.33E-02	1.30E-02	1.27E-02	1.24E-02	1.21E-02	1.18E-02	1.14E-02
17	FR-ann1000-all-500d	500	1.1	1000	annual	all	downwind	0.864	2.62E-02	5.44E-01	8.64E-01	8.55E-01	7.40E-01	6.20E-01	5.22E-01	4.49E-01	3.95E-01	3.54E-01	3.23E-01	2.98E-01	2.76E-01	2.58E-01	2.41E-01	2.27E-01	2.13E-01	2.01E-01
	FR-ann1000-all-500u	500	1.1	1000	annual	all	upwind	0.030	1.92E-04	7.17E-03	1.93E-02	2.76E-02	3.03E-02	3.03E-02	2.96E-02	2.89E-02	2.83E-02	2.76E-02	2.71E-02	2.66E-02	2.60E-02	2.55E-02	2.49E-02	2.42E-02	2.36E-02	2.29E-02
18	FR-ann50-all-1500d	1500	1.05	50	annual	all	downwind	0.011	2.85E-07	3.96E-04	3.44E-03	7.64E-03	1.03E-02	1.12E-02	1.12E-02	1.08E-02	1.01E-02	9.50E-03	8.91E-03	8.36E-03	7.89E-03	7.47E-03	7.10E-03	6.77E-03	6.47E-03	6.20E-03
	FR-ann50-all-1500u	1500	1.05	50	annual	all	upwind	0.001	0.00E+00	2.34E-06	2.20E-05	7.64E-05	1.54E-04	2.39E-04	3.17E-04	3.78E-04	4.27E-04	4.60E-04	4.86E-04	5.03E-04	5.15E-04	5.24E-04	5.31E-04	5.36E-04	5.39E-04	5.40E-04
19	FR-ann100-all-1500d	1500	1.05	100	annual	all	downwind	0.022	5.71E-07	7.92E-04	6.87E-03	1.53E-02	2.05E-02	2.25E-02	2.25E-02	2.15E-02	2.03E-02	1.90E-02	1.78E-02	1.67E-02	1.58E-02	1.49E-02	1.42E-02	1.35E-02	1.29E-02	1.24E-02
	FR-ann100-all-1500u	1500	1.05	100	annual	all	upwind	0.001	0.00E+00	4.68E-06	4.41E-05	1.53E-04	3.08E-04	4.78E-04	6.34E-04	7.56E-04	8.55E-04	9.21E-04	9.72E-04	1.01E-03	1.03E-03	1.05E-03	1.06E-03	1.07E-03	1.08E-03	1.08E-03
20	FR-ann200-all-1500d	1500	1.05	200	annual	all	downwind	0.045	1.14E-06	1.58E-03	1.37E-02	3.06E-02	4.10E-02	4.49E-02	4.49E-02	4.31E-02	4.06E-02	3.80E-02	3.56E-02	3.35E-02	3.16E-02	2.99E-02	2.84E-02	2.71E-02	2.59E-02	2.48E-02
	FR-ann200-all-1500u	1500	1.05	200	annual	all	upwind	0.002	0.00E+00	9.36E-06	8.81E-05	3.05E-04	6.16E-04	9.57E-04	1.27E-03	1.51E-03	1.71E-03	1.84E-03	1.94E-03	2.01E-03	2.06E-03	2.10E-03	2.12E-03	2.14E-03	2.15E-03	2.16E-03
21	FR-ann500-all-1500d	1500	1.05	500	annual	all	downwind	0.112	2.85E-06	3.96E-03	3.44E-02	7.64E-02	1.03E-01	1.12E-01	1.12E-01	1.08E-01	1.01E-01	9.50E-02	8.91E-02	8.36E-02	7.89E-02	7.47E-02	7.10E-02	6.77E-02	6.47E-02	6.20E-02
	FR-ann500-all-1500u	1500	1.05	500	annual	all	upwind	0.005	0.00E+00	2.34E-05	2.20E-04	7.64E-04	1.54E-03	2.39E-03	3.17E-03	3.78E-03	4.27E-03	4.60E-03	4.86E-03	5.03E-03	5.15E-03	5.24E-03	5.31E-03	5.36E-03	5.39E-03	5.40E-03
22	FR-ann1000-all-1500d	1500	1.05	1000	annual	all	downwind	0.225	5.71E-06	7.92E-03	6.87E-02	1.53E-01	2.05E-01	2.25E-01	2.25E-01	2.15E-01	2.03E-01	1.90E-01	1.78E-01	1.67E-01	1.58E-01	1.49E-01	1.42E-01	1.35E-01	1.29E-01	1.24E-01
	FR-ann1000-all-1500u	1500	1.05	1000	annual	all	upwind	0.011	0.00E+00	4.68E-05	4.41E-04	1.53E-03	3.08E-03	4.78E-03	6.34E-03	7.56E-03	8.55E-03	9.21E-03	9.72E-03	1.01E-02	1.03E-02	1.05E-02	1.06E-02	1.07E-02	1.08E-02	1.08E-02
23	FR-ann50-sum-500d	500	1.1	50	annual	summer	downwind	0.037	1.81E-03	2.67E-02	3.73E-02	3.41E-02	2.79E-02	2.23E-02	1.80E-02	1.46E-02	1.21E-02	1.01E-02	8.55E-03	7.32E-03	6.34E-03	5.54E-03	4.88E-03	4.33E-03	3.86E-03	3.47E-03
	FR-ann50-sum-500u	500	1.1	50	annual	summer	upwind	0.001	4.27E-06	2.10E-04	4.78E-04	5.58E-04	5.20E-04	4.50E-04	3.81E-04	3.21E-04	2.72E-04	2.32E-04	2.00E-04	1.74E-04	1.52E-04	1.34E-04	1.19E-04	1.07E-04	9.59E-05	8.68E-05
24	FR-ann100-sum-500d	500	1.1	100	annual	summer	downwind	0.075	3.63E-03	5.34E-02	7.45E-02	6.81E-02	5.57E-02	4.46E-02	3.59E-02	2.92E-02	2.41E-02	2.02E-02	1.71E-02	1.46E-02	1.27E-02	1.11E-02	9.75E-03	8.65E-03	7.73E-03	6.94E-03
	FR-ann100-sum-500u	500	1.1	100	annual	summer	upwind	0.001	8.55E-06	4.19E-04	9.57E-04	1.12E-03	1.04E-03	9.00E-04	7.62E-04	6.42E-04	5.44E-04	4.65E-04	4.00E-04	3.48E-04	3.04E-04	2.68E-04	2.38E-04	2.13E-04	1.92E-04	1.74E-04
25	FR-ann200-sum-500d	500	1.1	200	annual	summer	downwind	0.149	7.25E-03	1.07E-01	1.49E-01	1.36E-01	1.11E-01	8.93E-02	7.18E-02	5.84E-02	4.82E-02	4.03E-02	3.42E-02	2.93E-02	2.54E-02	2.21E-02	1.95E-02	1.73E-02	1.55E-02	1.39E-02
	FR-ann200-sum-500u	500	1.1	200	annual	summer	upwind	0.002	1.71E-05	8.39E-04	1.91E-03	2.23E-03	2.08E-03	1.80E-03	1.52E-03	1.28E-03	1.09E-03	9.29E-04	8.00E-04	6.95E-04	6.09E-04	5.37E-04	4.77E-04	4.26E-04	3.84E-04	3.47E-04
26	FR-ann500-sum-500d	500	1.1	500	annual	summer	downwind	1.115	5.43E-02	7.99E-01	1.11E+00	1.02E+00	8.34E-01	6.68E-01	5.37E-01	4.37E-01	3.61E-01	3.02E-01	2.56E-01	2.19E-01	1.90E-01	1.66E-01	1.46E-01	1.29E-01	1.16E-01	1.04E-01
	FR-ann500-sum-500u	500	1.1	500	annual	summer	upwind	0.017	1.28E-04	6.27E-03	1.43E-02	1.67E-02	1.56E-02	1.35E-02	1.14E-02	9.61E-03	8.14E-03	6.95E-03	5.99E-03	5.20E-03	4.55E-03	4.01E-03	3.57E-03	3.19E-03	2.87E-03	2.60E-03
27	FR-ann50-sum-1500d	1500	1.05	50	annual	summer	downwind	0.009	0.00E+00	4.46E-04	3.43E-03	7.07E-03	9.01E-03	9.45E-03	9.08E-03	8.36E-03	7.55E-03	6.75E-03	6.02E-03	5.37E-03	4.81E-03	4.31E-03	3.88E-03	3.51E-03	3.18E-03	2.90E-03
	FR-ann50-sum-1500u	1500	1.05	50	annual	summer	upwind	0.000	0.00E+00	6.10E-07	1.08E-05	4.37E-05	8.30E-05	1.11E-04	1.25E-04	1.29E-04	1.27E-04	1.20E-04	1.13E-04	1.05E-04	9.67E-05	8.90E-05	8.19E-05	7.54E-05	6.95E-05	6.42E-05
28	FR-ann100-sum-1500d	1500	1.05	100	annual	summer	downwind	0.019	3.05E-07	8.91E-04	6.86E-03	1.41E-02	1.80E-02	1.89E-02	1.82E-02	1.67E-02	1.51E-02	1.35E-02	1.20E-02	1.07E-02	9.61E-03	8.63E-03	7.77E-03	7.02E-03	6.37E-03	5.80E-03
	FR-ann100-sum-1500u	1500	1.05	100	annual	summer	upwind	0.000	0.00E+00	1.22E-06	2.15E-05	8.73E-05	1.66E-04	2.22E-04	2.51E-04	2.58E-04	2.53E-04	2.41E-04	2.26E-04	2.09E-04	1.93E-04	1.78E-04	1.64E-04	1.51E-04	1.39E-04	1.28E-04
29	FR-ann200-sum-1500d	1500	1.05	200	annual	summer	downwind	0.038	6.10E-07	1.78E-03	1.37E-02	2.83E-02	3.60E-02	3.78E-02	3.63E-02	3.35E-02	3.02E-02	2.70E-02	2.41E-02	2.15E-02	1.92E-02	1.73E-02	1.55E-02	1.40E-02	1.27E-02	1.16E-02
	FR-ann200-sum-1500u	1500	1.05	200	annual	summer	upwind	0.001	0.00E+00	2.44E-06	4.30E-05	1.75E-04	3.32E-04	4.44E-04	5.02E-04	5.17E-04	5.06E-04	4.82E-04	4.51E-04	4.19E-04	3.87E-04	3.56E-04	3.28E-04	3.02E-04	2.78E-04	2.57E-04
30	FR-ann500-sum-1500d	1500	1.05	500	annual	summer	downwind	0.283	4.57E-06	1.33E-02	1.03E-01	2.12E-01	2.70E-01	2.83E-01	2.72E-01	2.50E-01	2.26E-01	2.02E-01	1.80E-01	1.61E-01	1.44E-01	1.29E-01	1.16E-01	1.05E-01	9.52E-02	8.67E-02
	FR-ann500-sum-1500u	1500	1.05	500	annual	summer	upwind	0.004	0.00E+00	1.83E-05	3.22E-04	1.31E-03	2.48E-03	3.32E-03	3.75E-03	3.87E-03	3.79E-03	3.61E-03	3.38E-03	3.13E-03	2.89E-03	2.66E-03	2.45E-03	2.26E-03	2.08E-03	1.92E-03
31	FR-ann50-bus-500d	500	1.1	50	annual	business	downwind	0.060	2.28E-03	3.94E-02	5.99E-02	5.85E-02	5.03E-02	4.17E-02	3.45E-02	2.87E-02	2.42E-02	2.07E-02	1.79E-02	1.56E-02	1.38E-02	1.23E-02	1.10E-02	9.91E-03	8.98E-03	8.19E-03
	FR-ann50-bus-500u	500	1.1	50	annual	business	upwind	0.002	1.87E-05	6.65E-04	1.71E-03	2.33E-03	2.42E-03	2.26E-03	2.01E-03	1.77E-03	1.56E-03	1.37E-03	1.22E-03	1.09E-03	9.77E-04	8.82E-04	8.01E-04	7.31E-04	6.70E-04	6.17E-04
32	FR-ann100-bus-500d	500	1.1	100	annual	business	downwind	0.120	4.56E-03	7.88E-02	1.20E-01	1.17E-01	1.01E-01	8.34E-02	6.89E-02	5.75E-02	4.85E-02	4.14E-02	3.58E-02	3.13E-02	2.76E-02	2.45E-02	2.20E-02	1.98E-02	1.80E-02	1.64E-02
	FR-ann100-bus-500u	500	1.1	100	annual	business	upwind	0.005	3.74E-05	1.33E-03	3.43E-03	4.66E-03	4.85E-03	4.52E-03	4.02E-03	3.54E-03	3.12E-03	2.75E-03	2.44E-03	2.18E-03	1.95E-03	1.76E-03	1.60E-03	1.46E-03	1.34E-03	1.23E-03
33	FR-ann200-bus-500d	500	1.1	200	annual	business	downwind	0.240	9.12E-03	1.58E-01	2.40E-01	2.34E-01	2.01E-01	1.67E-01	1.38E-01	1.15E-01	9.70E-02	8.28E-02	7.16E-02	6.26E-02	5.52E-02	4.91E-02	4.39E-02	3.96E-02	3.59E-02	3.27E-02
	FR-ann200-bus-500u	500	1.1	200	annual	business	upwind	0.010	7.49E-05	2.66E-03	6.85E-03	9.33E-03	9.70E-03	9.03E-03	8.05E-03	7.09E-03	6.23E-03	5.50E-03	4.88E-03	4.35E-03	3.91E-03	3.53E-03	3.20E-03	2.92E-03	2.68E-03	2.47E-03
34	FR-ann500-bus-500d	500	1.1	500	annual	business	downwind	0.599	2.28E-02	3.94E-01	5.99E-01	5.85E-01	5.03E-01	4.17E-01	3.45E-01	2.87E-01	2.42E-01	2.07E-01	1.79E-01	1.56E-01	1.38E-01	1.23E-01	1.10E-01	9.91E-02	8.98E-02	8.19E-02
	FR-ann500-bus-500u	500	1.1	500	annual	business	upwind	0.024	1.87E-04	6.65E-03	1.71E-02	2.33E-02	2.42E-02	2.26E-02	2.01E-02	1.77E-02	1.56E-02	1.37E-02	1.22E-02	1.09E-02	9.77E-03	8.82E-03	8.01E-03	7.31E-03	6.70E-03	6.17E-03
35	FR-ann1000-bus-500d	500	1.1	1000	annual	business	downwind	1.198	4.56E-02	7.88E-01	1.20E+00	1.17E+00	1.01E+00	8.34E-01	6.89E-01	5.75E-01	4.85E-01	4.14E-01	3.58E-01	3.13E-01	2.76E-01	2.45E-01	2.20E-01	1.98E-01	1.80E-01	1.64E-01
	FR-ann1000-bus-500u	500	1.1	1000	annual	business	upwind	0.048	3.74E-04	1.33E-02	3.43E-02	4.66E-02	4.85E-02	4.52E-02	4.02E-02	3.54E-02	3.12E-02	2.75E-02	2.44E-02	2.18E-02	1.95E-02	1.76E-02	1.60E-02	1.46E-02	1.34E-02	1.23E-02
36	FR-ann50-bus-1500d	1500	1.05	50	annual	business	downwind	0.015	5.71E-07	6.35E-04	4.93E-03	1.05E-02	1.39E-02	1.52E-02	1.51E-02	1.43E-02	1.33E-02	1.22E-02	1.11E-02	1.01E-02	9.22E-03	8.43E-03	7.73E-03	7.11E-03	6.56E-03	6.06E-03
	FR-ann50-bus-1500u	1500	1.05	50	annual	business	upwind	0.001	0.00E+00	4.45E-06	4.08E-05	1.39E-04	2.71E-04	3.92E-04	4.80E-04	5.33E-04	5.56E-04	5.59E-04	5.49E-04	5.28E-04	5.04E-04	4.78E-04	4.52E-04	4.27E-04	4.04E-04	3.81E-04
37	FR-ann100-bus-1500d	1500	1.05	100	annual	business	downwind	0.030	1.14E-06	1.27E-03	9.86E-03	2.11E-02	2.79E-02	3.03E-02	3.01E-02	2.86E-02	2.65E-02	2.43E-02	2.22E-02	2.02E-02	1.84E-02	1.69E-02	1.55E-02	1.42E-02	1.31E-02	1.21E-02
	FR-ann100-bus-1500u	1500	1.05	100	annual	business	upwind	0.001	0.00E+00	8.90E-06	8.15E-05	2.78E-04	5.42E-04	7.84E-04	9.60E-04	1.07E-03	1.11E-03	1.12E-03	1.10E-03	1.06E-03	1.01E-03	9.56E-04	9.05E-04	8.55E-04	8.07E-04	7.63E-04
38	FR-ann200-bus-1500d	1500	1.05	200	annual	business	downwind	0.061	2.28E-06	2.54E-03	1.97E-02	4.21E-02	5.58E-02	6.06E-02	6.02E-02	5.72E-02	5.30E-02	4.86E-02	4.44E-02	4.04E-02	3.69E-02	3.37E-02	3.09E-02	2.84E-02	2.62E-02	2.43E-02
	FR-ann200-bus-1500u	1500	1.05	200	annual	business	upwind	0.002	0.00E+00	1.78E-05	1.63E-04	5.57E-04	1.08E-03	1.57E-03	1.92E-03	2.13E-03	2.23E-03	2.24E-03	2.20E-03	2.11E-03	2.01E-03	1.91E-03	1.81E-03	1.71E-03	1.61E-03	1.53E-03
39	FR-ann500-bus-1500d	1500	1.05	500	annual	business	downwind	0.152	5.71E-06	6.35E-03	4.93E-02	1.05E-01	1.39E-01	1.52E-01	1.51E-01	1.43E-01	1.33E-01	1.22E-01	1.11E-01	1.01E-01	9.22E-02	8.43E-02	7.73E-02	7.11E-02	6.56E-02	6.06E-02
	FR-ann500-bus-1500u	1500	1.05	500	annual	business	upwind	0.006	0.00E+00	4.45E-05	4.08E-04	1.39E-03	2.71E-03	3.92E-03	4.80E-03	5.33E-03	5.56E-03	5.59E-03	5.49E-03	5.28E-03	5.04E-03	4.78E-03	4.52E-03	4.27E-03	4.04E-03	3.81E-03
40	FR-ann1000-bus-1500d	1500	1.05	1000	annual	business	downwind	0.303	1.14E-05	1.27E-02	9.86E-02	2.11E-01	2.79E-01	3.03E-01	3.01E-01	2.86E-01	2.65E-01	2.43E-01	2.22E-01	2.02E-01	1.84E-01	1.69E-01	1.55E-01	1.42E-01	1.31E-01	1.21E-01
	FR-ann1000-bus-1500u	1500	1.05	1000	annual	business	upwind	0.011	0.00E+00	8.90E-05	8.15E-04	2.78E-03	5.42E-03	7.84E-03	9.60E-03	1.07E-02	1.11E-02	1.12E-02	1.10E-02	1.06E-02	1.01E-02	9.56E-03	9.05E-03	8.55E-03	8.07E-03	7.63E-03

*The distance downwind from the BUG represents the distance along a diagonal line in a coordinate grid.

Model	Name	269	283	424	566	707	849	990	1131	1273	1414	1556	1697	1838	1980	2121	2263	2404	2546	2687	2828	3536	4243	4950	5657	6364	7071
1	FR-1H-all-500	19.830	18.896	16.593	13.355	10.655	8.650	7.174	6.067	5.220	4.556	4.111	3.828	3.587	3.379	3.198	3.039	2.897	2.771	2.658	2.555	2.158	1.885	1.685	1.531	1.407	1.305
2	FR-1H-all-1500	8.843	8.435	8.344	8.120	7.244	6.315	5.496	4.812	4.248	3.782	3.395	3.071	2.797	2.563	2.361	2.186	2.034	1.899	1.780	1.674	1.281	1.031	0.859	0.734	0.640	0.566
3	FR-1H-sum-500	11.166	10.269	8.401	6.627	5.224	4.206	3.466	2.917	2.499	2.173	1.914	1.704	1.531	1.387	1.265	1.161	1.071	0.993	0.924	0.864	0.645	0.508	0.416	0.350	0.301	0.263
4	FR-1H-sum-1500	6.845	6.463	4.392	4.154	3.638	3.131	2.700	2.346	2.058	1.823	1.629	1.468	1.332	1.216	1.117	1.031	0.956	0.890	0.832	0.780	0.589	0.469	0.386	0.326	0.281	0.246
5	FR-1H-bus-500	19.830	18.896	13.209	10.093	8.115	6.901	6.030	5.374	4.862	4.450	4.111	3.828	3.587	3.379	3.198	3.039	2.897	2.771	2.658	2.555	2.158	1.885	1.685	1.531	1.407	1.305
6	FR-1H-bus-1500	8.843	8.435	7.451	6.707	5.708	4.828	4.116	3.551	3.102	2.739	2.443	2.199	1.995	1.822	1.674	1.547	1.436	1.339	1.254	1.178	0.899	0.731	0.654	0.595	0.547	0.508
7	FR-24H-all-500	5.775	5.598	3.893	2.740	2.020	1.554	1.237	1.013	0.848	0.723	0.625	0.548	0.485	0.433	0.390	0.354	0.323	0.296	0.273	0.241	0.190	0.158	0.136	0.119	0.106	0.096
8	FR-24H-all-1500	3.063	2.970	2.549	2.012	1.585	1.272	1.042	0.870	0.739	0.637	0.556	0.491	0.437	0.392	0.355	0.323	0.296	0.272	0.251	0.178	0.168	0.128	0.103	0.087	0.076	0.070
9	FR-H-sum-500	1.436	1.470	1.018	0.551	0.438	0.316	0.191	0.190	0.155	0.130	0.130	0.112	0.097	0.084	0.077	0.067	0.069	0.063	0.057	0.053	0.049	0.045	0.030	0.023	0.019	0.016
10	FR-24H-sum-1500	0.884	1.168	0.811	0.432	0.335	0.253	0.142	0.161	0.134	0.109	0.113	0.098	0.085	0.075	0.068	0.061	0.062	0.056	0.052	0.047	0.044	0.041	0.028	0.022	0.018	0.015
11	FR-24H-bus-500	3.504	3.213	1.962	1.446	1.098	0.863	0.699	0.580	0.491	0.422	0.368	0.325	0.290	0.260	0.236	0.215	0.197	0.182	0.168	0.159	0.131	0.112	0.099	0.088	0.080	0.073
12	FR-24H-bus-1500	2.245	2.075	1.227	0.990	0.814	0.674	0.565	0.481	0.415	0.362	0.320	0.285	0.256	0.232	0.211	0.193	0.178	0.167	0.159	0.152	0.125	0.107	0.094	0.084	0.076	0.070
13	FR-ann50-all-500d	9.51E-03	8.99E-03	5.46E-03	3.64E-03	2.60E-03	1.96E-03	1.54E-03	1.25E-03	1.03E-03	8.74E-04	7.52E-04	6.56E-04	5.78E-04	5.15E-04	4.63E-04	4.19E-04	3.81E-04	3.49E-04	3.22E-04	2.97E-04	2.12E-04	1.62E-04	1.29E-04	1.07E-04	8.99E-05	7.74E-05
	FR-ann50-all-500u	1.11E-03	1.07E-03	7.47E-04	5.28E-04	3.90E-04	3.00E-04	2.39E-04	1.95E-04	1.63E-04	1.39E-04	1.20E-04	1.05E-04	9.30E-05	8.30E-05	7.48E-05	6.78E-05	6.18E-05	5.66E-05	5.22E-05	4.83E-05	3.45E-05	2.63E-05	2.09E-05	1.72E-05	1.44E-05	1.24E-05
14	FR-ann100-all-500d	1.90E-02	1.80E-02	1.09E-02	7.28E-03	5.20E-03	3.92E-03	3.08E-03	2.49E-03	2.07E-03	1.75E-03	1.50E-03	1.31E-03	1.16E-03	1.03E-03	9.26E-04	8.38E-04	7.63E-04	6.99E-04	6.43E-04	5.95E-04	4.25E-04	3.24E-04	2.58E-04	2.13E-04	1.80E-04	1.55E-04
	FR-ann100-all-500u	2.22E-03	2.14E-03	1.49E-03	1.06E-03	7.80E-04	6.00E-04	4.78E-04	3.91E-04	3.26E-04	2.78E-04	2.40E-04	2.10E-04	1.86E-04	1.66E-04	1.50E-04	1.36E-04	1.24E-04	1.13E-04	1.04E-04	9.66E-05	6.91E-05	5.25E-05	4.18E-05	3.44E-05	2.89E-05	2.48E-05
15	FR-ann200-all-500d	3.80E-02	3.60E-02	2.18E-02	1.46E-02	1.04E-02	7.85E-03	6.16E-03	4.98E-03	4.13E-03	3.50E-03	3.01E-03	2.62E-03	2.31E-03	2.06E-03	1.85E-03	1.68E-03	1.53E-03	1.40E-03	1.29E-03	1.19E-03	8.50E-04	6.48E-04	5.17E-04	4.26E-04	3.60E-04	3.10E-04
	FR-ann200-all-500u	4.43E-03	4.29E-03	2.99E-03	2.11E-03	1.56E-03	1.20E-03	9.55E-04	7.81E-04	6.53E-04	5.56E-04	4.80E-04	4.21E-04	3.72E-04	3.32E-04	2.99E-04	2.71E-04	2.47E-04	2.26E-04	2.09E-04	1.93E-04	1.38E-04	1.05E-04	8.36E-05	6.87E-05	5.78E-05	4.95E-05
16	FR-ann500-all-500d	9.51E-02	8.99E-02	5.46E-02	3.64E-02	2.60E-02	1.96E-02	1.54E-02	1.25E-02	1.03E-02	8.74E-03	7.52E-03	6.56E-03	5.78E-03	5.15E-03	4.63E-03	4.19E-03	3.81E-03	3.49E-03	3.22E-03	2.97E-03	2.12E-03	1.62E-03	1.29E-03	1.07E-03	8.99E-04	7.74E-04
	FR-ann500-all-500u	1.11E-02	1.07E-02	7.47E-03	5.28E-03	3.90E-03	3.00E-03	2.39E-03	1.95E-03	1.63E-03	1.39E-03	1.20E-03	1.05E-03	9.30E-04	8.30E-04	7.48E-04	6.78E-04	6.18E-04	5.66E-04	5.22E-04	4.83E-04	3.45E-04	2.63E-04	2.09E-04	1.72E-04	1.44E-04	1.24E-04
17	FR-ann1000-all-500d	1.90E-01	1.80E-01	1.09E-01	7.28E-02	5.20E-02	3.92E-02	3.08E-02	2.49E-02	2.07E-02	1.75E-02	1.50E-02	1.31E-02	1.16E-02	1.03E-02	9.26E-03	8.38E-03	7.63E-03	6.99E-03	6.43E-03	5.95E-03	4.25E-03	3.24E-03	2.58E-03	2.13E-03	1.80E-03	1.55E-03
	FR-ann1000-all-500u	2.22E-02	2.14E-02	1.49E-02	1.06E-02	7.80E-03	6.00E-03	4.78E-03	3.91E-03	3.26E-03	2.78E-03	2.40E-03	2.10E-03	1.86E-03	1.66E-03	1.50E-03	1.36E-03	1.24E-03	1.13E-03	1.04E-03	9.66E-04	6.91E-04	5.25E-04	4.18E-04	3.44E-04	2.89E-04	2.48E-04
18	FR-ann50-all-1500d	5.95E-03	5.71E-03	3.92E-03	2.82E-03	2.11E-03	1.64E-03	1.32E-03	1.09E-03	9.11E-04	7.79E-04	6.75E-04	5.92E-04	5.25E-04	4.70E-04	4.23E-04	3.84E-04	3.51E-04	3.22E-04	2.97E-04	2.75E-04	1.98E-04	1.52E-04	1.21E-04	1.00E-04	8.48E-05	7.31E-05
	FR-ann50-all-1500u	5.39E-04	5.37E-04	4.65E-04	3.72E-04	2.96E-04	2.39E-04	1.96E-04	1.64E-04	1.40E-04	1.20E-04	1.05E-04	9.29E-05	8.27E-05	7.43E-05	6.72E-05	6.12E-05	5.60E-05	5.15E-05	4.76E-05	4.41E-05	3.18E-05	2.44E-05	1.95E-05	1.60E-05	1.35E-05	1.16E-05
19	FR-ann100-all-1500d	1.19E-02	1.14E-02	7.83E-03	5.63E-03	4.23E-03	3.29E-03	2.64E-03	2.17E-03	1.82E-03	1.56E-03	1.35E-03	1.18E-03	1.05E-03	9.39E-04	8.47E-04	7.69E-04	7.02E-04	6.44E-04	5.95E-04	5.51E-04	3.96E-04	3.03E-04	2.43E-04	2.00E-04	1.70E-04	1.46E-04
	FR-ann100-all-1500u	1.08E-03	1.07E-03	9.31E-04	7.45E-04	5.92E-04	4.78E-04	3.92E-04	3.28E-04	2.79E-04	2.41E-04	2.10E-04	1.86E-04	1.65E-04	1.49E-04	1.34E-04	1.22E-04	1.12E-04	1.03E-04	9.52E-05	8.82E-05	6.37E-05	4.87E-05	3.89E-05	3.21E-05	2.71E-05	2.32E-05
20	FR-ann200-all-1500d	2.38E-02	2.28E-02	1.57E-02	1.13E-02	8.46E-03	6.58E-03	5.28E-03	4.34E-03	3.65E-03	3.11E-03	2.70E-03	2.37E-03	2.10E-03	1.88E-03	1.69E-03	1.54E-03	1.40E-03	1.29E-03	1.19E-03	1.10E-03	7.92E-04	6.07E-04	4.86E-04	4.01E-04	3.39E-04	2.92E-04
	FR-ann200-all-1500u	2.16E-03	2.15E-03	1.86E-03	1.49E-03	1.18E-03	9.55E-04	7.85E-04	6.57E-04	5.58E-04	4.82E-04	4.21E-04	3.71E-04	3.31E-04	2.97E-04	2.69E-04	2.45E-04	2.24E-04	2.06E-04	1.90E-04	1.76E-04	1.27E-04	9.75E-05	7.79E-05	6.42E-05	5.41E-05	4.63E-05
21	FR-ann500-all-1500d	5.95E-02	5.71E-02	3.92E-02	2.82E-02	2.11E-02	1.64E-02	1.32E-02	1.09E-02	9.11E-03	7.79E-03	6.75E-03	5.92E-03	5.25E-03	4.70E-03	4.23E-03	3.84E-03	3.51E-03	3.22E-03	2.97E-03	2.75E-03	1.98E-03	1.52E-03	1.21E-03	1.00E-03	8.48E-04	7.31E-04
	FR-ann500-all-1500u	5.39E-03	5.37E-03	4.65E-03	3.72E-03	2.96E-03	2.39E-03	1.96E-03	1.64E-03	1.40E-03	1.20E-03	1.05E-03	9.29E-04	8.27E-04	7.43E-04	6.72E-04	6.12E-04	5.60E-04	5.15E-04	4.76E-04	4.41E-04	3.18E-04	2.44E-04	1.95E-04	1.60E-04	1.35E-04	1.16E-04
22	FR-ann1000-all-1500d	1.19E-01	1.14E-01	7.83E-02	5.63E-02	4.23E-02	3.29E-02	2.64E-02	2.17E-02	1.82E-02	1.56E-02	1.35E-02	1.18E-02	1.05E-02	9.39E-03	8.47E-03	7.69E-03	7.02E-03	6.44E-03	5.95E-03	5.51E-03	3.96E-03	3.03E-03	2.43E-03	2.00E-03	1.70E-03	1.46E-03
	FR-ann1000-all-1500u	1.08E-02	1.07E-02	9.31E-03	7.45E-03	5.92E-03	4.78E-03	3.92E-03	3.28E-03	2.79E-03	2.41E-03	2.10E-03	1.86E-03	1.65E-03	1.49E-03	1.34E-03	1.22E-03	1.12E-03	1.03E-03	9.52E-04	8.82E-04	6.37E-04	4.87E-04	3.89E-04	3.21E-04	2.71E-04	2.32E-04
23	FR-ann50-sum-500d	3.13E-03	2.84E-03	1.31E-03	7.51E-04	4.87E-04	3.43E-04	2.55E-04	1.99E-04	1.60E-04	1.33E-04	1.12E-04	9.72E-05	8.53E-05	7.59E-05	6.82E-05	6.19E-05	5.66E-05	5.21E-05	4.83E-05	4.50E-05	3.36E-05	2.69E-05	2.25E-05	1.93E-05	1.70E-05	1.52E-05
	FR-ann50-sum-500u	7.88E-05	7.20E-05	3.47E-05	2.05E-05	1.36E-05	9.69E-06	7.33E-06	5.80E-06	4.73E-06	3.97E-06	3.36E-06	2.98E-06	2.59E-06	2.37E-06	2.14E-06	1.98E-06	1.83E-06	1.68E-06	1.60E-06	1.45E-06	1.14E-06	9.16E-07	7.63E-07	6.87E-07	6.10E-07	5.34E-07
24	FR-ann100-sum-500d	6.27E-03	5.69E-03	2.62E-03	1.50E-03	9.75E-04	6.86E-04	5.11E-04	3.97E-04	3.20E-04	2.65E-04	2.25E-04	1.94E-04	1.71E-04	1.52E-04	1.36E-04	1.24E-04	1.13E-04	1.04E-04	9.66E-05	9.00E-05	6.72E-05	5.37E-05	4.50E-05	3.86E-05	3.40E-05	3.04E-05
	FR-ann100-sum-500u	1.58E-04	1.44E-04	6.94E-05	4.11E-05	2.72E-05	1.94E-05	1.47E-05	1.16E-05	9.46E-06	7.94E-06	6.72E-06	5.95E-06	5.19E-06	4.73E-06	4.27E-06	3.97E-06	3.66E-06	3.36E-06	3.21E-06	2.90E-06	2.29E-06	1.83E-06	1.53E-06	1.37E-06	1.22E-06	1.07E-06
25	FR-ann200-sum-500d	1.25E-02	1.14E-02	5.24E-03	3.00E-03	1.95E-03	1.37E-03	1.02E-03	7.95E-04	6.40E-04	5.31E-04	4.50E-04	3.89E-04	3.41E-04	3.04E-04	2.73E-04	2.48E-04	2.26E-04	2.08E-04	1.93E-04	1.80E-04	1.34E-04	1.07E-04	9.00E-05	7.72E-05	6.81E-05	6.07E-05
	FR-ann200-sum-500u	3.15E-04	2.88E-04	1.39E-04	8.21E-05	5.43E-05	3.88E-05	2.93E-05	2.32E-05	1.89E-05	1.59E-05	1.34E-05	1.19E-05	1.04E-05	9.46E-06	8.55E-06	7.94E-06	7.33E-06	6.72E-06	6.41E-06	5.80E-06	4.58E-06	3.66E-06	3.05E-06	2.75E-06	2.44E-06	2.14E-06
26	FR-ann500-sum-500d	9.38E-02	8.51E-02	3.92E-02	2.25E-02	1.46E-02	1.03E-02	7.64E-03	5.95E-03	4.79E-03	3.97E-03	3.37E-03	2.91E-03	2.55E-03	2.27E-03	2.04E-03	1.85E-03	1.69E-03	1.56E-03	1.45E-03	1.35E-03	1.00E-03	8.04E-04	6.74E-04	5.78E-04	5.09E-04	4.54E-04
	FR-ann500-sum-500u	2.36E-03	2.15E-03	1.04E-03	6.14E-04	4.06E-04	2.90E-04	2.19E-04	1.74E-04	1.42E-04	1.19E-04	1.00E-04	8.90E-05	7.76E-05	7.08E-05	6.39E-05	5.94E-05	5.48E-05	5.02E-05	4.79E-05	4.34E-05	3.42E-05	2.74E-05	2.28E-05	2.05E-05	1.83E-05	1.60E-05
27	FR-ann50-sum-1500d	2.65E-03	2.43E-03	1.18E-03	6.89E-04	4.52E-04	3.20E-04	2.39E-04	1.87E-04	1.51E-04	1.25E-04	1.06E-04	9.20E-05	8.09E-05	7.20E-05	6.47E-05	5.88E-05	5.38E-05	4.95E-05	4.59E-05	4.28E-05	3.20E-05	2.56E-05	2.14E-05	1.85E-05	1.63E-05	1.45E-05
	FR-ann50-sum-1500u	5.94E-05	5.51E-05	2.88E-05	1.76E-05	1.19E-05	8.62E-06	6.56E-06	5.27E-06	4.27E-06	3.59E-06	3.13E-06	2.75E-06	2.44E-06	2.21E-06	1.98E-06	1.83E-06	1.68E-06	1.60E-06	1.45E-06	1.37E-06	1.07E-06	8.39E-07	6.87E-07	6.10E-07	5.34E-07	4.58E-07
28	FR-ann100-sum-1500d	5.29E-03	4.85E-03	2.36E-03	1.38E-03	9.04E-04	6.40E-04	4.79E-04	3.74E-04	3.02E-04	2.50E-04	2.13E-04	1.84E-04	1.62E-04	1.44E-04	1.29E-04	1.18E-04	1.08E-04	9.91E-05	9.19E-05	8.56E-05	6.39E-05	5.13E-05	4.29E-05	3.69E-05	3.25E-05	2.90E-05
	FR-ann100-sum-1500u	1.19E-04	1.10E-04	5.77E-05	3.53E-05	2.38E-05	1.72E-05	1.31E-05	1.05E-05	8.55E-06	7.17E-06	6.26E-06	5.49E-06	4.88E-06	4.43E-06	3.97E-06	3.66E-06	3.36E-06	3.21E-06	2.90E-06	2.75E-06	2.14E-06	1.68E-06	1.37E-06	1.22E-06	1.07E-06	9.16E-07
29	FR-ann200-sum-1500d	1.06E-02	9.70E-03	4.71E-03	2.76E-03	1.81E-03	1.28E-03	9.58E-04	7.48E-04	6.03E-04	5.01E-04	4.26E-04	3.68E-04	3.24E-04	2.88E-04	2.59E-04	2.35E-04	2.15E-04	1.98E-04	1.84E-04	1.71E-04	1.28E-04	1.03E-04	8.58E-05	7.39E-05	6.50E-05	5.80E-05
	FR-ann200-sum-1500u	2.38E-04	2.20E-04	1.15E-04	7.05E-05	4.76E-05	3.45E-05	2.63E-05	2.11E-05	1.71E-05	1.43E-05	1.25E-05	1.10E-05	9.77E-06	8.85E-06	7.94E-06	7.33E-06	6.72E-06	6.41E-06	5.80E-06	5.49E-06	4.27E-06	3.36E-06	2.75E-06	2.44E-06	2.14E-06	1.83E-06
30	FR-ann500-sum-1500d	7.92E-02	7.26E-02	3.52E-02	2.06E-02	1.35E-02	9.58E-03	7.16E-03	5.59E-03	4.51E-03	3.75E-03	3.18E-03	2.75E-03	2.42E-03	2.15E-03	1.94E-03	1.76E-03	1.61E-03	1.48E-03	1.37E-03	1.28E-03	9.57E-04	7.67E-04	6.42E-04	5.53E-04	4.86E-04	4.34E-04
	FR-ann500-sum-1500u	1.78E-03	1.65E-03	8.63E-04	5.27E-04	3.56E-04	2.58E-04	1.96E-04	1.58E-04	1.28E-04	1.07E-04	9.36E-05	8.22E-05	7.31E-05	6.62E-05	5.94E-05	5.48E-05	5.02E-05	4.79E-05	4.34E-05	4.11E-05	3.20E-05	2.51E-05	2.05E-05	1.83E-05	1.60E-05	1.37E-05
31	FR-ann50-bus-500d	7.50E-03	6.89E-03	3.50E-03	2.13E-03	1.45E-03	1.05E-03	8.03E-04	6.38E-04	5.21E-04	4.37E-04	3.73E-04	3.24E-04	2.85E-04	2.54E-04	2.28E-04	2.07E-04	1.89E-04	1.73E-04	1.60E-04	1.49E-04	1.09E-04	8.49E-05	6.95E-05	5.87E-05	5.07E-05	4.46E-05
	FR-ann50-bus-500u	5.70E-04	5.28E-04	2.85E-04	1.80E-04	1.24E-04	9.18E-05	7.09E-05	5.67E-05	4.68E-05	3.94E-05	3.38E-05	2.95E-05	2.60E-05	2.33E-05	2.09E-05	1.89E-05	1.74E-05	1.60E-05	1.47E-05	1.37E-05	9.93E-06	7.76E-06	6.28E-06	5.25E-06	4.45E-06	3.88E-06
32	FR-ann100-bus-500d	1.50E-02	1.38E-02	7.00E-03	4.27E-03	2.89E-03	2.10E-03	1.61E-03	1.28E-03	1.04E-03	8.74E-04	7.46E-04	6.48E-04	5.70E-04	5.08E-04	4.56E-04	4.13E-04	3.77E-04	3.47E-04	3.20E-04	2.97E-04	2.17E-04	1.70E-04	1.39E-04	1.17E-04	1.01E-04	8.93E-05
	FR-ann100-bus-500u	1.14E-03	1.06E-03	5.70E-04	3.59E-04	2.49E-04	1.84E-04	1.42E-04	1.13E-04	9.36E-05	7.88E-05	6.76E-05	5.89E-05	5.21E-05	4.66E-05	4.18E-05	3.79E-05	3.47E-05	3.20E-05	2.95E-05	2.74E-05	1.99E-05	1.55E-05	1.26E-05	1.05E-05	8.90E-06	7.76E-06
33	FR-ann200-bus-500d	3.00E-02	2.76E-02	1.40E-02	8.54E-03	5.78E-03	4.20E-03	3.21E-03	2.55E-03	2.09E-03	1.75E-03	1.49E-03	1.30E-03	1.14E-03	1.02E-03	9.12E-04	8.26E-04	7.55E-04	6.93E-04	6.40E-04	5.95E-04	4.34E-04	3.40E-04	2.78E-04	2.35E-04	2.03E-04	1.79E-04
	FR-ann200-bus-500u	2.28E-03	2.11E-03	1.14E-03	7.18E-04	4.97E-04	3.67E-04	2.84E-04	2.27E-04	1.87E-04	1.58E-04	1.35E-04	1.18E-04	1.04E-04	9.32E-05	8.36E-05	7.58E-05	6.94E-05	6.39E-05	5.89E-05	5.48E-05	3.97E-05	3.11E-05	2.51E-05	2.10E-05	1.78E-05	1.55E-05
34	FR-ann500-bus-500d	7.50E-02	6.89E-02	3.50E-02	2.13E-02	1.45E-02	1.05E-02	8.03E-03	6.38E-03	5.21E-03	4.37E-03	3.73E-03	3.24E-03	2.85E-03	2.54E-03	2.28E-03	2.07E-03	1.89E-03	1.73E-03	1.60E-03	1.49E-03	1.09E-03	8.49E-04	6.95E-04	5.87E-04	5.07E-04	4.46E-04
	FR-ann500-bus-500u	5.70E-03	5.28E-03	2.85E-03	1.80E-03	1.24E-03	9.18E-04	7.09E-04	5.67E-04	4.68E-04	3.94E-04	3.38E-04	2.95E-04	2.60E-04	2.33E-04	2.09E-04	1.89E-04	1.74E-04	1.60E-04	1.47E-04	1.37E-04	9.93E-05	7.76E-05	6.28E-05	5.25E-05	4.45E-05	3.88E-05
35	FR-ann1000-bus-500d	1.50E-01	1.38E-01	7.00E-02	4.27E-02	2.89E-02	2.10E-02	1.61E-02	1.28E-02	1.04E-02	8.74E-03	7.46E-03	6.48E-03	5.70E-03	5.08E-03	4.56E-03	4.13E-03	3.77E-03	3.47E-03	3.20E-03	2.97E-03	2.17E-03	1.70E-03	1.39E-03	1.17E-03	1.01E-03	8.93E-04
	FR-ann1000-bus-500u	1.14E-02	1.06E-02	5.70E-03	3.59E-03	2.49E-03	1.84E-03	1.42E-03	1.13E-03	9.36E-04	7.88E-04	6.76E-04	5.89E-04	5.21E-04	4.66E-04	4.18E-04	3.79E-04	3.47E-04	3.20E-04	2.95E-04	2.74E-04	1.99E-04	1.55E-04	1.26E-04	1.05E-04	8.90E-05	7.76E-05
36	FR-ann50-bus-1500d	5.62E-03	5.23E-03	2.85E-03	1.81E-03	1.26E-03	9.29E-04	7.18E-04	5.75E-04	4.74E-04	3.99E-04	3.42E-04	2.98E-04	2.63E-04	2.35E-04	2.12E-04	1.92E-04	1.76E-04	1.62E-04	1.49E-04	1.39E-04	1.02E-04	8.00E-05	6.55E-05	5.55E-05	4.79E-05	4.22E-05
	FR-ann50-bus-1500u	3.61E-04	3.41E-04	2.08E-04	1.40E-04	1.01E-04	7.66E-05	6.04E-05	4.90E-05	4.08E-05	3.47E-05	2.99E-05	2.63E-05	2.33E-05	2.09E-05	1.88E-05	1.71E-05	1.58E-05	1.45E-05	1.35E-05	1.24E-05	9.13E-06	7.19E-06	5.82E-06	4.91E-06	4.22E-06	3.65E-06
37	FR-ann100-bus-1500d	1.12E-02	1.05E-02	5.71E-03	3.62E-03	2.51E-03	1.86E-03	1.44E-03	1.15E-03	9.47E-04	7.97E-04	6.84E-04	5.96E-04	5.26E-04	4.70E-04	4.23E-04	3.84E-04	3.51E-04	3.23E-04	2.99E-04	2.78E-04	2.04E-04	1.60E-04	1.31E-04	1.11E-04	9.59E-05	8.45E-05
	FR-ann100-bus-1500u	7.21E-04	6.82E-04	4.17E-04	2.81E-04	2.02E-04	1.53E-04	1.21E-04	9.79E-05	8.15E-05	6.94E-05	5.98E-05	5.25E-05	4.66E-05	4.18E-05	3.77E-05	3.42E-05	3.15E-05	2.90E-05	2.69E-05	2.49E-05	1.83E-05	1.44E-05	1.16E-05	9.82E-06	8.45E-06	7.31E-06
38	FR-ann200-bus-1500d	2.25E-02	2.09E-02	1.14E-02	7.24E-03	5.03E-03	3.71E-03	2.87E-03	2.30E-03	1.89E-03	1.59E-03	1.37E-03	1.19E-03	1.05E-03	9.40E-04	8.47E-04	7.68E-04	7.03E-04	6.47E-04	5.98E-04	5.56E-04	4.08E-04	3.20E-04	2.62E-04	2.22E-04	1.92E-04	1.69E-04
	FR-ann200-bus-1500u	1.44E-03	1.36E-03	8.34E-04	5.61E-04	4.05E-04	3.06E-04	2.42E-04	1.96E-04	1.63E-04	1.39E-04	1.20E-04	1.05E-04	9.32E-05	8.36E-05	7.53E-05	6.85E-05	6.30E-05	5.80E-05	5.39E-05	4.98E-05	3.65E-05	2.88E-05	2.33E-05	1.96E-05	1.69E-05	1.46E-05
39	FR-ann500-bus-1500d	5.62E-02	5.23E-02	2.85E-02	1.81E-02	1.26E-02	9.29E-03	7.18E-03	5.75E-03	4.74E-03	3.99E-03	3.42E-03	2.98E-03	2.63E-03	2.35E-03	2.12E-03	1.92E-03	1.76E-03	1.62E-03	1.49E-03	1.39E-03	1.02E-03	8.00E-04	6.55E-04	5.55E-04	4.79E-04	4.22E-04
	FR-ann500-bus-1500u	3.61E-03	3.41E-03	2.08E-03	1.40E-03	1.01E-03	7.66E-04	6.04E-04	4.90E-04	4.08E-04	3.47E-04	2.99E-04	2.63E-04	2.33E-04	2.09E-04	1.88E-04	1.71E-04	1.58E-04	1.45E-04	1.35E-04	1.24E-04	9.13E-05	7.19E-05	5.82E-05	4.91E-05	4.22E-05	3.65E-05
40	FR-ann1000-bus-1500d	1.12E-01	1.05E-01	5.71E-02	3.62E-02	2.51E-02	1.86E-02	1.44E-02	1.15E-02	9.47E-03	7.97E-03	6.84E-03	5.96E-03	5.26E-03	4.70E-03	4.23E-03	3.84E-03	3.51E-03	3.23E-03	2.99E-03	2.78E-03	2.04E-03	1.60E-03	1.31E-03	1.11E-03	9.59E-04	8.45E-04
	FR-ann1000-bus-1500u	7.21E-03	6.82E-03	4.17E-03	2.81E-03	2.02E-03	1.53E-03	1.21E-03	9.79E-04	8.15E-04	6.94E-04	5.98E-04	5.25E-04	4.66E-04	4.18E-04	3.77E-04	3.42E-04	3.15E-04	2.90E-04	2.69E-04	2.49E-04	1.83E-04	1.44E-04	1.16E-04	9.82E-05	8.45E-05	7.31E-05

Table FR2: Acrolein 1-Hour Hazard Index for Fresno

concentrations in micrograms/m^3 Acrolein MRL 0.19 ug/m3

Model Run number	Name	Engine Size (hp)	Hours of run time per year	Model outputs	Scenario	Max	Distance Downwind (meters)										
							14	28	42	57	71	85	99	113	127	141	156
1	FR-1H-all-500	500	8760	max 1-hour	all	0.11	0.06	0.11	0.10	0.09	0.08	0.07	0.06	0.06	0.06	0.06	0.05
2	FR-1H-all-1500	1500	8760	max 1-hour	all	0.01	0.00	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.00
3	FR-1H-sum-500	500	732	max 1-hour	summer	0.11	0.04	0.11	0.10	0.09	0.08	0.07	0.06	0.05	0.05	0.04	0.04
4	FR-1H-sum-1500	1500	732	max 1-hour	summer	0.01	0.00	0.00	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.00
5	FR-1H-bus-500	500	4380	max 1-hour	business	0.11	0.06	0.11	0.10	0.09	0.08	0.07	0.06	0.06	0.06	0.06	0.05
6	FR-1H-bus-1500	1500	4380	max 1-hour	business	0.01	0.00	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.00

Model Run number	Name	170	184	198	212	226	240	255	269	283	424	566	707	849	990	1131	1273
1	FR-1H-all-500	0.05	0.04	0.04	0.04	0.04	0.03	0.03	0.03	0.03	0.03	0.02	0.02	0.01	0.01	0.01	0.01
2	FR-1H-all-1500	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3	FR-1H-sum-500	0.03	0.03	0.03	0.03	0.02	0.02	0.02	0.02	0.02	0.01	0.01	0.01	0.01	0.01	0.00	0.00
4	FR-1H-sum-1500	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5	FR-1H-bus-500	0.05	0.04	0.04	0.04	0.04	0.03	0.03	0.03	0.03	0.02	0.02	0.01	0.01	0.01	0.01	0.01
6	FR-1H-bus-1500	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Model Run number	Name	1414	1556	1697	1838	1980	2121	2263	2404	2546	2687	2828	3536	4243	4950	5657	6364	7071
1	FR-1H-all-500	0.01	0.01	0.01	0.01	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2	FR-1H-all-1500	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3	FR-1H-sum-500	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4	FR-1H-sum-1500	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5	FR-1H-bus-500	0.01	0.01	0.01	0.01	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
6	FR-1H-bus-1500	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Table FR3: 24-Hour PM Concentrations as Percent of CalEPA 24-Hour Standard for Fresno

concentrations in micrograms/m^3 50 ug/m3 PM10 Standard

Model Run number	Name	Engine Size (hp)	Hours of run time per year	Model outputs	Scenario	Max	Distance Downwind (meters)										
							14	28	42	57	71	85	99	113	127	141	156
7	FR-24H-all-500	500	8760	24-hour	all	92.40%	6.89%	80.08%	92.40%	74.65%	58.42%	45.45%	36.10%	30.99%	27.22%	23.87%	20.98%
8	FR-24H-all-1500	1500	8760	24-hour	all	28.31%	0.08%	3.60%	17.47%	26.92%	28.31%	26.02%	22.75%	19.56%	17.02%	14.84%	12.97%
9	FR-H-sum-500	500	732	24-hour	summer	26.12%	5.74%	17.76%	14.29%	26.12%	11.59%	21.46%	9.25%	6.88%	9.61%	8.31%	11.62%
10	FR-24H-sum-1500	1500	732	24-hour	summer	7.29%	3.98%	7.29%	6.88%	4.27%	2.76%	6.62%	2.79%	2.75%	5.50%	2.58%	6.12%
11	FR-24H-bus-500	500	4380	24-hour	business	48.33%	6.39%	44.17%	48.33%	41.43%	38.73%	33.36%	28.10%	23.60%	19.91%	17.72%	15.85%
12	FR-24H-bus-1500	1500	4380	24-hour	business	14.03%	0.08%	3.17%	10.38%	14.03%	13.89%	13.10%	11.88%	10.48%	10.09%	9.53%	8.85%

Model Run	Name	170	184	198	212	226	240	255	269	283	424	566	707	849	990	1131	1273
7	FR-24H-all-500	18.50%	16.39%	15.18%	14.10%	13.13%	12.27%	11.89%	11.55%	11.20%	7.79%	5.48%	4.04%	3.11%	2.47%	2.03%	1.70%
8	FR-24H-all-1500	11.40%	10.07%	8.95%	8.09%	7.35%	6.86%	6.44%	6.13%	5.94%	5.10%	4.02%	3.17%	2.54%	2.08%	1.74%	1.48%
9	FR-H-sum-500	5.05%	8.01%	6.75%	3.20%	3.66%	3.75%	3.30%	2.87%	2.94%	2.04%	1.10%	0.88%	0.63%	0.38%	0.38%	0.31%
10	FR-24H-sum-1500	3.56%	4.98%	4.46%	1.93%	1.95%	2.87%	2.58%	1.77%	2.34%	1.62%	0.86%	0.67%	0.51%	0.28%	0.32%	0.27%
11	FR-24H-bus-500	14.17%	12.69%	11.39%	10.27%	9.28%	8.42%	7.67%	7.01%	6.43%	3.92%	2.89%	2.20%	1.73%	1.40%	1.16%	0.98%
12	FR-24H-bus-1500	8.15%	7.48%	6.85%	6.28%	5.76%	5.29%	4.87%	4.49%	4.15%	2.45%	1.98%	1.63%	1.35%	1.13%	0.96%	0.83%

Model Run	Name	1414	1556	1697	1838	1980	2121	2263	2404	2546	2687	2828	3536	4243	4950	5657	6364	7071
7	FR-24H-all-500	1.45%	1.25%	1.10%	0.97%	0.87%	0.78%	0.71%	0.65%	0.59%	0.55%	0.48%	0.38%	0.32%	0.27%	0.24%	0.21%	0.19%
8	FR-24H-all-1500	1.27%	1.11%	0.98%	0.87%	0.78%	0.71%	0.65%	0.59%	0.54%	0.50%	0.36%	0.34%	0.26%	0.21%	0.17%	0.15%	0.14%
9	FR-H-sum-500	0.26%	0.26%	0.22%	0.19%	0.17%	0.15%	0.13%	0.14%	0.13%	0.11%	0.11%	0.10%	0.09%	0.06%	0.05%	0.04%	0.03%
10	FR-24H-sum-1500	0.22%	0.23%	0.20%	0.17%	0.15%	0.14%	0.12%	0.12%	0.11%	0.10%	0.09%	0.09%	0.08%	0.06%	0.04%	0.04%	0.03%
11	FR-24H-bus-500	0.84%	0.74%	0.65%	0.58%	0.52%	0.47%	0.43%	0.39%	0.36%	0.34%	0.32%	0.26%	0.22%	0.20%	0.18%	0.16%	0.15%
12	FR-24H-bus-1500	0.72%	0.64%	0.57%	0.51%	0.46%	0.42%	0.39%	0.36%	0.33%	0.32%	0.30%	0.25%	0.21%	0.19%	0.17%	0.15%	0.14%

Table FR4: Chronic Cancer Risk for Fresno

concentrations in micrograms/m^3

Model Run number	Name	Engine Size (hp)	Hours of run time per year	Model outputs	Scenario	Wind	Max	Distance Downwind (meters)																											
								14	28	42	57	71	85	99	113	127	141	156	170	184	198	212	226	240	255	269	283	424	566	707	849	990	1131	1273	1414
13	FR-ann50-all-500d	500	50	annual	all	downwind	13.0	0.39	8.16	12.97	12.83	11.10	9.29	7.83	6.73	5.93	5.32	4.85	4.46	4.14	3.87	3.62	3.40	3.20	3.02	2.85	2.70	1.64	1.09	0.78	0.59	0.46	0.37	0.31	0.26
	FR-ann50-all-500u	500	50	annual	all	upwind	0.5	0.00	0.11	0.29	0.41	0.45	0.45	0.44	0.43	0.42	0.41	0.41	0.40	0.39	0.38	0.37	0.36	0.35	0.34	0.33	0.32	0.22	0.16	0.12	0.09	0.07	0.06	0.05	0.04
14	FR-ann100-all-500d	500	100	annual	all	downwind	25.9	0.79	16.32	25.93	25.66	22.19	18.59	15.66	13.46	11.85	10.63	9.69	8.93	8.28	7.73	7.24	6.80	6.40	6.04	5.70	5.39	3.28	2.18	1.56	1.18	0.92	0.75	0.62	0.52
	FR-ann100-all-500u	500	100	annual	all	upwind	0.9	0.01	0.21	0.58	0.83	0.91	0.91	0.89	0.87	0.85	0.83	0.81	0.80	0.78	0.76	0.75	0.73	0.71	0.69	0.66	0.64	0.45	0.32	0.23	0.18	0.14	0.12	0.10	0.08
15	FR-ann200-all-500d	500	200	annual	all	downwind	51.9	1.57	32.64	51.86	51.32	44.39	37.17	31.32	26.93	23.70	21.27	19.39	17.85	16.57	15.46	14.48	13.60	12.81	12.08	11.41	10.79	6.55	4.37	3.12	2.35	1.85	1.49	1.24	1.05
	FR-ann200-all-500u	500	200	annual	all	upwind	1.8	0.01	0.43	1.16	1.65	1.82	1.82	1.78	1.73	1.70	1.66	1.63	1.59	1.56	1.53	1.49	1.45	1.41	1.37	1.33	1.29	0.90	0.63	0.47	0.36	0.29	0.23	0.20	0.17
16	FR-ann500-all-500d	500	500	annual	all	downwind	129.7	3.93	81.61	129.66	128.29	110.96	92.94	78.30	67.32	59.26	53.17	48.47	44.63	41.42	38.65	36.20	34.00	32.02	30.20	28.52	26.97	16.39	10.92	7.81	5.88	4.62	3.74	3.10	2.62
	FR-ann500-all-500u	500	500	annual	all	upwind	4.5	0.03	1.07	2.89	4.13	4.54	4.55	4.44	4.33	4.24	4.15	4.07	3.99	3.91	3.82	3.73	3.63	3.53	3.43	3.32	3.21	2.24	1.58	1.17	0.90	0.72	0.59	0.49	0.42
17	FR-ann1000-all-500d	500	1000	annual	all	downwind	259.3	7.86	163.21	259.32	256.58	221.93	185.87	156.60	134.63	118.51	106.33	96.94	89.27	82.85	77.30	72.40	68.01	64.03	60.39	57.04	53.95	32.77	21.84	15.61	11.77	9.23	7.47	6.20	5.25
	FR-ann1000-all-500u	500	1000	annual	all	upwind	9.1	0.06	2.15	5.78	8.27	9.08	9.10	8.88	8.66	8.49	8.29	8.13	7.97	7.81	7.64	7.46	7.27	7.07	6.86	6.65	6.43	4.48	3.17	2.34	1.80	1.43	1.17	0.98	0.83
18	FR-ann50-all-1500d	1500	50	annual	all	downwind	3.4	0.00	0.12	1.03	2.29	3.08	3.37	3.37	3.23	3.04	2.85	2.67	2.51	2.37	2.24	2.13	2.03	1.94	1.86	1.78	1.71	1.17	0.85	0.63	0.49	0.40	0.33	0.27	0.23
	FR-ann50-all-1500u	1500	50	annual	all	upwind	0.2	0.00	0.00	0.01	0.02	0.05	0.07	0.10	0.11	0.13	0.14	0.15	0.15	0.15	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.14	0.11	0.09	0.07	0.06	0.05	0.04	0.04
19	FR-ann100-all-1500d	1500	100	annual	all	downwind	6.7	0.00	0.24	2.06	4.59	6.15	6.74	6.74	6.46	6.09	5.70	5.34	5.02	4.74	4.48	4.26	4.06	3.88	3.72	3.57	3.42	2.35	1.69	1.27	0.99	0.79	0.65	0.55	0.47
	FR-ann100-all-1500u	1500	100	annual	all	upwind	0.3	0.00	0.00	0.01	0.05	0.09	0.14	0.19	0.23	0.26	0.28	0.29	0.30	0.31	0.31	0.32	0.32	0.32	0.32	0.32	0.32	0.28	0.22	0.18	0.14	0.12	0.10	0.08	0.07
20	FR-ann200-all-1500d	1500	200	annual	all	downwind	13.5	0.00	0.48	4.12	9.17	12.30	13.47	13.48	12.92	12.17	11.40	10.69	10.04	9.47	8.97	8.53	8.13	7.77	7.44	7.13	6.85	4.70	3.38	2.54	1.97	1.58	1.30	1.09	0.93
	FR-ann200-all-1500u	1500	200	annual	all	upwind	0.6	0.00	0.00	0.03	0.09	0.18	0.29	0.38	0.45	0.51	0.55	0.58	0.60	0.62	0.63	0.64	0.64	0.65	0.65	0.65	0.64	0.56	0.45	0.36	0.29	0.24	0.20	0.17	0.14
21	FR-ann500-all-1500d	1500	500	annual	all	downwind	33.7	0.00	1.19	10.31	22.93	30.76	33.69	33.69	32.29	30.43	28.49	26.72	25.09	23.68	22.42	21.31	20.32	19.42	18.60	17.84	17.12	11.75	8.45	6.34	4.93	3.96	3.26	2.73	2.34
	FR-ann500-all-1500u	1500	500	annual	all	upwind	1.6	0.00	0.01	0.07	0.23	0.46	0.72	0.95	1.13	1.28	1.38	1.46	1.51	1.54	1.57	1.59	1.61	1.62	1.62	1.62	1.61	1.40	1.12	0.89	0.72	0.59	0.49	0.42	0.36
22	FR-ann1000-all-1500d	1500	1000	annual	all	downwind	67.4	0.00	2.38	20.62	45.86	61.52	67.37	67.38	64.59	60.86	56.98	53.43	50.19	47.36	44.85	42.63	40.64	38.84	37.20	35.67	34.25	23.50	16.90	12.68	9.87	7.92	6.51	5.47	4.67
	FR-ann1000-all-1500u	1500	1000	annual	all	upwind	3.2	0.00	0.01	0.13	0.46	0.92	1.43	1.90	2.27	2.56	2.76	2.92	3.02	3.09	3.14	3.18	3.21	3.23	3.24	3.23	3.22	2.79	2.23	1.78	1.43	1.18	0.98	0.84	0.72
23	FR-ann50-sum-500d	500	50	annual	summer	downwind	11.2	0.54	8.01	11.18	10.22	8.36	6.70	5.39	4.38	3.62	3.03	2.56	2.20	1.90	1.66	1.46	1.30	1.16	1.04	0.94	0.85	0.39	0.23	0.15	0.10	0.08	0.06	0.05	0.04
	FR-ann50-sum-500u	500	50	annual	summer	upwind	0.2	0.00	0.06	0.14	0.17	0.16	0.14	0.11	0.10	0.08	0.07	0.06	0.05	0.05	0.04	0.04	0.03	0.03	0.03	0.02	0.02	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00
24	FR-ann100-sum-500d	500	100	annual	summer	downwind	22.4	1.09	16.02	22.35	20.44	16.72	13.39	10.77	8.77	7.23	6.05	5.13	4.39	3.80	3.32	2.93	2.60	2.32	2.08	1.88	1.71	0.79	0.45	0.29	0.21	0.15	0.12	0.10	0.08
	FR-ann100-sum-500u	500	100	annual	summer	upwind	0.3	0.00	0.13	0.29	0.33	0.31	0.27	0.23	0.19	0.16	0.14	0.12	0.10	0.09	0.08	0.07	0.06	0.06	0.05	0.05	0.04	0.02	0.01	0.01	0.01	0.00	0.00	0.00	0.00
25	FR-ann200-sum-500d	500	200	annual	summer	downwind	44.7	2.18	32.04	44.70	40.87	33.45	26.79	21.54	17.53	14.47	12.10	10.25	8.79	7.61	6.64	5.85	5.19	4.64	4.16	3.76	3.41	1.57	0.90	0.58	0.41	0.31	0.24	0.19	0.16
	FR-ann200-sum-500u	500	200	annual	summer	upwind	0.7	0.01	0.25	0.57	0.67	0.62	0.54	0.46	0.39	0.33	0.28	0.24	0.21	0.18	0.16	0.14	0.13	0.12	0.10	0.09	0.09	0.04	0.02	0.02	0.01	0.01	0.01	0.01	0.00
26	FR-ann500-sum-500d	500	500	annual	summer	downwind	334.4	16.28	239.66	334.36	305.69	250.16	200.34	161.13	131.15	108.23	90.53	76.70	65.72	56.89	49.70	43.77	38.83	34.68	31.15	28.13	25.53	11.75	6.74	4.37	3.08	2.29	1.78	1.44	1.19
	FR-ann500-sum-500u	500	500	annual	summer	upwind	5.0	0.04	1.88	4.29	5.01	4.67	4.04	3.42	2.88	2.44	2.08	1.80	1.56	1.37	1.20	1.07	0.96	0.86	0.78	0.71	0.65	0.31	0.18	0.12	0.09	0.07	0.05	0.04	0.04
27	FR-ann50-sum-1500d	1500	50	annual	summer	downwind	2.8	0.00	0.13	1.03	2.12	2.70	2.84	2.72	2.51	2.26	2.02	1.81	1.61	1.44	1.29	1.17	1.05	0.96	0.87	0.79	0.73	0.35	0.21	0.14	0.10	0.07	0.06	0.05	0.04
	FR-ann50-sum-1500u	1500	50	annual	summer	upwind	0.0	0.00	0.00	0.00	0.01	0.02	0.03	0.04	0.04	0.04	0.04	0.03	0.03	0.03	0.03	0.02	0.02	0.02	0.02	0.02	0.02	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00
28	FR-ann100-sum-1500d	1500	100	annual	summer	downwind	5.7	0.00	0.27	2.06	4.24	5.41	5.67	5.45	5.02	4.53	4.05	3.61	3.22	2.88	2.59	2.33	2.11	1.91	1.74	1.59	1.46	0.71	0.41	0.27	0.19	0.14	0.11	0.09	0.08
	FR-ann100-sum-1500u	1500	100	annual	summer	upwind	0.1	0.00	0.00	0.01	0.03	0.05	0.07	0.08	0.08	0.08	0.07	0.07	0.06	0.06	0.05	0.05	0.05	0.04	0.04	0.04	0.03	0.02	0.01	0.01	0.01	0.00	0.00	0.00	0.00
29	FR-ann200-sum-1500d	1500	200	annual	summer	downwind	11.3	0.00	0.53	4.11	8.49	10.81	11.34	10.90	10.04	9.06	8.10	7.22	6.45	5.77	5.18	4.66	4.21	3.82	3.48	3.18	2.91	1.41	0.83	0.54	0.38	0.29	0.22	0.18	0.15
	FR-ann200-sum-1500u	1500	200	annual	summer	upwind	0.2	0.00	0.00	0.01	0.05	0.10	0.13	0.15	0.16	0.15	0.14	0.14	0.13	0.12	0.11	0.10	0.09	0.08	0.08	0.07	0.07	0.03	0.02	0.01	0.01	0.01	0.01	0.01	0.00
30	FR-ann500-sum-1500d	1500	500	annual	summer	downwind	84.8	0.00	4.00	30.77	63.48	80.88	84.85	81.51	75.06	67.73	60.56	54.03	48.23	43.14	38.71	34.86	31.50	28.57	26.01	23.76	21.78	10.57	6.19	4.06	2.87	2.15	1.68	1.35	1.12
	FR-ann500-sum-1500u	1500	500	annual	summer	upwind	1.2	0.00	0.01	0.10	0.39	0.74	1.00	1.13	1.16	1.14	1.08	1.01	0.94	0.87	0.80	0.73	0.68	0.62	0.58	0.53	0.49	0.26	0.16	0.11	0.08	0.06	0.05	0.04	0.03
31	FR-ann50-bus-500d	500	50	annual	business	downwind	18.0	0.68	11.81	17.96	17.55	15.08	12.51	10.34	8.62	7.27	6.21	5.37	4.69	4.14	3.68	3.30	2.97	2.69	2.46	2.25	2.07	1.05	0.64	0.43	0.32	0.24	0.19	0.16	0.13
	FR-ann50-bus-500u	500	50	annual	business	upwind	0.7	0.01	0.20	0.51	0.70	0.73	0.68	0.60	0.53	0.47	0.41	0.37	0.33	0.29	0.26	0.24	0.22	0.20	0.19	0.17	0.16	0.09	0.05	0.04	0.03	0.02	0.02	0.01	0.01
32	FR-ann100-bus-500d	500	100	annual	business	downwind	35.9	1.37	23.63	35.93	35.11	30.16	25.02	20.68	17.24	14.55	12.43	10.74	9.38	8.28	7.36	6.59	5.94	5.39	4.91	4.50	4.14	2.10	1.28	0.87	0.63	0.48	0.38	0.31	0.26
	FR-ann100-bus-500u	500	100	annual	business	upwind	1.5	0.01	0.40	1.03	1.40	1.45	1.35	1.21	1.06	0.94	0.82	0.73	0.65	0.59	0.53	0.48	0.44	0.40	0.37	0.34	0.32	0.17	0.11	0.07	0.06	0.04	0.03	0.03	0.02
33	FR-ann200-bus-500d	500	200	annual	business	downwind	71.9	2.74	47.26	71.86	70.21	60.32	50.04	41.37	34.49	29.10	24.85	21.48	18.77	16.55	14.72	13.18	11.89	10.78	9.82	8.99	8.27	4.20	2.56	1.74	1.26	0.96	0.77	0.63	0.52
	FR-ann200-bus-500u	500	200	annual	business	upwind	2.9	0.02	0.80	2.06	2.80	2.91	2.71	2.41	2.13	1.87	1.65	1.46	1.31	1.17	1.06	0.96	0.88	0.80	0.74	0.68	0.63	0.34	0.22	0.15	0.11	0.09	0.07	0.06	0.05
34	FR-ann500-bus-500d	500	500	annual	business	downwind	179.6	6.84	118.14	179.64	175.53	150.80	125.09	103.42	86.22	72.75	62.13	53.71	46.92	41.38	36.79	32.96	29.72	26.95	24.56	22.49	20.68	10.50	6.40	4.34	3.15	2.41	1.91	1.56	1.31
	FR-ann500-bus-500u	500	500	annual	business	upwind	7.3	0.06	1.99	5.14	6.99	7.27	6.77	6.04	5.31	4.68	4.12	3.66	3.27	2.93	2.65	2.40	2.19	2.01	1.85	1.71	1.59	0.85	0.54	0.37	0.28	0.21	0.17	0.14	0.12
35	FR-ann1000-bus-500d	500	1000	annual	business	downwind	359.3	13.69	236.29	359.28	351.07	301.61	250.18	206.83	172.43	145.49	124.27	107.42	93.84	82.75	73.59	65.92	59.43	53.89	49.12	44.97	41.35	21.00	12.80	8.68	6.31	4.82	3.83	3.13	2.62
	FR-ann1000-bus-500u	500	1000	annual	business	upwind	14.5	0.11	3.99	10.28	13.99	14.55	13.55	12.07	10.63	9.35	8.25	7.32	6.53	5.86	5.29	4.80	4.38	4.02	3.70	3.42	3.17	1.71	1.08	0.75	0.55	0.43	0.34	0.28	0.24
36	FR-ann50-bus-1500d	1500	50	annual	business	downwind	4.5	0.00	0.19	1.48	3.16	4.18	4.55	4.52	4.29	3.98	3.65	3.33	3.03	2.77	2.53	2.32	2.13	1.97	1.82	1.69	1.57	0.86	0.54	0.38	0.28	0.22	0.17	0.14	0.12
	FR-ann50-bus-1500u	1500	50	annual	business	upwind	0.2	0.00	0.00	0.01	0.04	0.08	0.12	0.14	0.16	0.17	0.17	0.16	0.16	0.15	0.14	0.14	0.13	0.12	0.11	0.11	0.10	0.06	0.04	0.03	0.02	0.02	0.01	0.01	0.01
37	FR-ann100-bus-1500d	1500	100	annual	business	downwind	9.1	0.00	0.38	2.96	6.32	8.36	9.10	9.03	8.57	7.95	7.29	6.66	6.07	5.53	5.06	4.64	4.27	3.93	3.64	3.37	3.14	1.71	1.09	0.75	0.56	0.43	0.35	0.28	0.24
	FR-ann100-bus-1500u	1500	100	annual	business	upwind	0.3	0.00	0.00	0.02	0.08	0.16	0.24	0.29	0.32	0.33	0.34	0.33	0.32	0.30	0.29	0.27	0.26	0.24	0.23	0.22	0.20	0.13	0.08	0.06	0.05	0.04	0.03	0.02	0.02
38	FR-ann200-bus-1500d	1500	200	annual	business	downwind	18.2	0.00	0.76	5.91	12.64	16.73	18.19	18.07	17.15	15.91	14.59	13.31	12.13	11.07	10.12	9.28	8.53	7.87	7.28	6.75	6.28	3.43	2.17	1.51	1.11	0.86	0.69	0.57	0.48
	FR-ann200-bus-1500u	1500	200	annual	business	upwind	0.7	0.00	0.01	0.05	0.17	0.33	0.47	0.58	0.64	0.67	0.67	0.66	0.63	0.60	0.57	0.54	0.51	0.48	0.46	0.43	0.41	0.25	0.17	0.12	0.09	0.07	0.06	0.05	0.04
39	FR-ann500-bus-1500d	1500	500	annual	business	downwind	45.5	0.00	1.90	14.78	31.61	41.81	45.48	45.17	42.87	39.77	36.46	33.28	30.33	27.67	25.30	23.20	21.33	19.67	18.19	16.87	15.69	8.56	5.43	3.77	2.79	2.15	1.73	1.42	1.20
	FR-ann500-bus-1500u	1500	500	annual	business	upwind	1.7	0.00	0.01	0.12	0.42	0.81	1.18	1.44	1.60	1.67	1.68	1.65	1.58	1.51	1.43	1.36	1.28	1.21	1.14	1.08	1.02	0.63	0.42	0.30	0.23	0.18	0.15	0.12	0.10
40	FR-ann1000-bus-1500d	1500	1000	annual	business	downwind	91.0	0.00	3.81	29.57	63.21	83.63	90.95	90.33	85.75	79.54	72.93	66.57	60.66	55.34	50.60	46.39	42.65	39.34	36.39	33.75	31.39	17.13	10.86	7.54	5.57	4.31	3.45	2.84	2.39
	FR-ann1000-bus-1500u	1500	1000	annual	business	upwind	3.4	0.00	0.03	0.24	0.83	1.63	2.35	2.88	3.20	3.34	3.36	3.29	3.17	3.02	2.87	2.71	2.56	2.42	2.29	2.16	2.05	1.25	0.84	0.61	0.46	0.36	0.29	0.24	0.21

Model Run number	**Name**	1556	1697	1838	1980	2121	2263	2404	2546	2687	2828	3536	4243	4950	5657	6364	7071
13	FR-ann50-all-500d	0.23	0.20	0.17	0.15	0.14	0.13	0.11	0.10	0.10	0.09	0.06	0.05	0.04	0.03	0.03	0.02
	FR-ann50-all-500u	0.04	0.03	0.03	0.02	0.02	0.02	0.02	0.02	0.02	0.01	0.01	0.01	0.01	0.01	0.00	0.00
14	FR-ann100-all-500d	0.45	0.39	0.35	0.31	0.28	0.25	0.23	0.21	0.19	0.18	0.13	0.10	0.08	0.06	0.05	0.05
	FR-ann100-all-500u	0.07	0.06	0.06	0.05	0.04	0.04	0.04	0.03	0.03	0.03	0.02	0.02	0.01	0.01	0.01	0.01
15	FR-ann200-all-500d	0.90	0.79	0.69	0.62	0.56	0.50	0.46	0.42	0.39	0.36	0.25	0.19	0.16	0.13	0.11	0.09
	FR-ann200-all-500u	0.14	0.13	0.11	0.10	0.09	0.08	0.07	0.07	0.06	0.06	0.04	0.03	0.03	0.02	0.02	0.01
16	FR-ann500-all-500d	2.26	1.97	1.74	1.55	1.39	1.26	1.14	1.05	0.97	0.89	0.64	0.49	0.39	0.32	0.27	0.23
	FR-ann500-all-500u	0.36	0.32	0.28	0.25	0.22	0.20	0.19	0.17	0.16	0.14	0.10	0.08	0.06	0.05	0.04	0.04
17	FR-ann1000-all-500d	4.51	3.93	3.47	3.09	2.78	2.51	2.29	2.10	1.93	1.78	1.27	0.97	0.78	0.64	0.54	0.46
	FR-ann1000-all-500u	0.72	0.63	0.56	0.50	0.45	0.41	0.37	0.34	0.31	0.29	0.21	0.16	0.13	0.10	0.09	0.07
18	FR-ann50-all-1500d	0.20	0.18	0.16	0.14	0.13	0.12	0.11	0.10	0.09	0.08	0.06	0.05	0.04	0.03	0.03	0.02
	FR-ann50-all-1500u	0.03	0.03	0.02	0.02	0.02	0.02	0.02	0.02	0.01	0.01	0.01	0.01	0.01	0.00	0.00	0.00
19	FR-ann100-all-1500d	0.40	0.36	0.31	0.28	0.25	0.23	0.21	0.19	0.18	0.17	0.12	0.09	0.07	0.06	0.05	0.04
	FR-ann100-all-1500u	0.06	0.06	0.05	0.04	0.04	0.04	0.03	0.03	0.03	0.03	0.02	0.01	0.01	0.01	0.01	0.01
20	FR-ann200-all-1500d	0.81	0.71	0.63	0.56	0.51	0.46	0.42	0.39	0.36	0.33	0.24	0.18	0.15	0.12	0.10	0.09
	FR-ann200-all-1500u	0.13	0.11	0.10	0.09	0.08	0.07	0.07	0.06	0.06	0.05	0.04	0.03	0.02	0.02	0.02	0.01
21	FR-ann500-all-1500d	2.02	1.78	1.57	1.41	1.27	1.15	1.05	0.97	0.89	0.83	0.59	0.46	0.36	0.30	0.25	0.22
	FR-ann500-all-1500u	0.32	0.28	0.25	0.22	0.20	0.18	0.17	0.15	0.14	0.13	0.10	0.07	0.06	0.05	0.04	0.03
22	FR-ann1000-all-1500d	4.05	3.55	3.15	2.82	2.54	2.31	2.11	1.93	1.78	1.65	1.19	0.91	0.73	0.60	0.51	0.44
	FR-ann1000-all-1500u	0.63	0.56	0.50	0.45	0.40	0.37	0.34	0.31	0.29	0.26	0.19	0.15	0.12	0.10	0.08	0.07
23	FR-ann50-sum-500d	0.03	0.03	0.03	0.02	0.02	0.02	0.02	0.02	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.00
	FR-ann50-sum-500u	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
24	FR-ann100-sum-500d	0.07	0.06	0.05	0.05	0.04	0.04	0.03	0.03	0.03	0.03	0.02	0.02	0.01	0.01	0.01	0.01
	FR-ann100-sum-500u	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
25	FR-ann200-sum-500d	0.13	0.12	0.10	0.09	0.08	0.07	0.07	0.06	0.06	0.05	0.04	0.03	0.03	0.02	0.02	0.02
	FR-ann200-sum-500u	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
26	FR-ann500-sum-500d	1.01	0.87	0.77	0.68	0.61	0.56	0.51	0.47	0.43	0.40	0.30	0.24	0.20	0.17	0.15	0.14
	FR-ann500-sum-500u	0.03	0.03	0.02	0.02	0.02	0.02	0.02	0.02	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.00
27	FR-ann50-sum-1500d	0.03	0.03	0.02	0.02	0.02	0.02	0.02	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.00	0.00
	FR-ann50-sum-1500u	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
28	FR-ann100-sum-1500d	0.06	0.06	0.05	0.04	0.04	0.04	0.03	0.03	0.03	0.03	0.02	0.02	0.01	0.01	0.01	0.01
	FR-ann100-sum-1500u	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
29	FR-ann200-sum-1500d	0.13	0.11	0.10	0.09	0.08	0.07	0.06	0.06	0.06	0.05	0.04	0.03	0.03	0.02	0.02	0.02
	FR-ann200-sum-1500u	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
30	FR-ann500-sum-1500d	0.95	0.83	0.73	0.65	0.58	0.53	0.48	0.44	0.41	0.38	0.29	0.23	0.19	0.17	0.15	0.13
	FR-ann500-sum-1500u	0.03	0.02	0.02	0.02	0.02	0.02	0.02	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.00	0.00
31	FR-ann50-bus-500d	0.11	0.10	0.09	0.08	0.07	0.06	0.06	0.05	0.05	0.04	0.03	0.03	0.02	0.02	0.02	0.01
	FR-ann50-bus-500u	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
32	FR-ann100-bus-500d	0.22	0.19	0.17	0.15	0.14	0.12	0.11	0.10	0.10	0.09	0.07	0.05	0.04	0.04	0.03	0.03
	FR-ann100-bus-500u	0.02	0.02	0.02	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.00	0.00	0.00	0.00	0.00
33	FR-ann200-bus-500d	0.45	0.39	0.34	0.30	0.27	0.25	0.23	0.21	0.19	0.18	0.13	0.10	0.08	0.07	0.06	0.05
	FR-ann200-bus-500u	0.04	0.04	0.03	0.03	0.03	0.02	0.02	0.02	0.02	0.02	0.01	0.01	0.01	0.01	0.01	0.00
34	FR-ann500-bus-500d	1.12	0.97	0.86	0.76	0.68	0.62	0.57	0.52	0.48	0.45	0.33	0.25	0.21	0.18	0.15	0.13
	FR-ann500-bus-500u	0.10	0.09	0.08	0.07	0.06	0.06	0.05	0.05	0.04	0.04	0.03	0.02	0.02	0.02	0.01	0.01
35	FR-ann1000-bus-500d	2.24	1.94	1.71	1.52	1.37	1.24	1.13	1.04	0.96	0.89	0.65	0.51	0.42	0.35	0.30	0.27
	FR-ann1000-bus-500u	0.20	0.18	0.16	0.14	0.13	0.11	0.10	0.10	0.09	0.08	0.06	0.05	0.04	0.03	0.03	0.02
36	FR-ann50-bus-1500d	0.10	0.09	0.08	0.07	0.06	0.06	0.05	0.05	0.04	0.04	0.03	0.02	0.02	0.02	0.01	0.01
	FR-ann50-bus-1500u	0.01	0.01	0.01	0.01	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
37	FR-ann100-bus-1500d	0.21	0.18	0.16	0.14	0.13	0.12	0.11	0.10	0.09	0.08	0.06	0.05	0.04	0.03	0.03	0.03
	FR-ann100-bus-1500u	0.02	0.02	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.00	0.00	0.00	0.00	0.00
38	FR-ann200-bus-1500d	0.41	0.36	0.32	0.28	0.25	0.23	0.21	0.19	0.18	0.17	0.12	0.10	0.08	0.07	0.06	0.05
	FR-ann200-bus-1500u	0.04	0.03	0.03	0.03	0.02	0.02	0.02	0.02	0.02	0.01	0.01	0.01	0.01	0.01	0.01	0.00
39	FR-ann500-bus-1500d	1.03	0.89	0.79	0.70	0.63	0.58	0.53	0.48	0.45	0.42	0.31	0.24	0.20	0.17	0.14	0.13
	FR-ann500-bus-1500u	0.09	0.08	0.07	0.06	0.06	0.05	0.05	0.04	0.04	0.04	0.03	0.02	0.02	0.01	0.01	0.01
40	FR-ann1000-bus-1500d	2.05	1.79	1.58	1.41	1.27	1.15	1.05	0.97	0.90	0.83	0.61	0.48	0.39	0.33	0.29	0.25
	FR-ann1000-bus-1500u	0.18	0.16	0.14	0.13	0.11	0.10	0.09	0.09	0.08	0.07	0.05	0.04	0.03	0.03	0.03	0.02

Table SF1: Model Results for San Francisco

concentrations in micrograms/m^3

Model Run number	Name	Engine Size (hp)	PM Emissions (lb/hr)	Hours of run time per year	Model outputs	Scenario	Wind	Max	Distance Downwind (meters)*													
									14	28	42	57	71	85	99	113	127	141	156	170	184	198
1	SF-1H-all-500	500	1.1	8760	max 1-hour	all		67.09	53.581	67.091	62.972	54.315	46.957	41.952	37.516	33.488	30.664	28.191	25.676	24.090	22.573	21.039
2	SF-1H-all-1500	1500	1.05	8760	max 1-hour	all		27.42	4.693	25.835	24.864	25.690	27.422	25.368	22.506	19.897	17.744	15.995	14.560	13.366	12.354	11.486
3	SF-1H-sum-500	500	1.1	732	max 1-hour	summer		67.09	45.988	67.091	62.972	54.199	46.957	40.533	34.905	29.892	25.642	22.334	19.511	17.125	15.112	13.412
4	SF-1H-sum-1500	1500	1.05	732	max 1-hour	summer		23.12	1.295	21.973	23.119	22.756	20.194	17.848	16.029	14.162	12.763	11.583	10.783	9.966	9.167	8.467
5	SF-1H-bus-500	500	1.1	4380	max 1-hour	business		67.09	53.581	67.091	62.972	54.315	46.957	41.952	37.516	33.488	30.664	28.191	25.676	24.090	22.573	21.039
6	SF-1H-bus-1500	1500	1.05	4380	max 1-hour	business		27.42	4.693	25.835	24.864	25.690	27.422	25.368	22.506	19.897	17.744	15.995	14.560	13.366	12.354	11.486
7	SF-24H-all-500	500	1.1	8760	24-hour	all		39.68	11.324	36.242	39.680	34.311	27.469	21.803	17.485	14.227	11.750	9.842	8.350	7.165	6.212	5.435
8	SF-24H-all-1500	1500	1.05	8760	24-hour	all		12.33	0.482	8.113	12.325	11.950	12.123	10.994	9.954	8.874	7.842	6.918	6.114	5.426	4.836	4.330
9	SF-24H-sum-500	500	1.1	732	24-hour	summer		16.31	4.357	15.878	16.308	12.911	9.718	7.399	5.762	4.589	3.731	3.089	2.597	2.213	1.909	1.663
10	SF-24H-sum-1500	1500	1.05	732	24-hour	summer		5.51	0.083	2.527	4.989	5.514	5.115	4.636	4.012	3.425	2.921	2.503	2.161	1.881	1.649	1.455
11	SF-24H-bus-500	500	1.1	4380	24-hour	business		28.23	10.035	27.266	28.227	21.928	16.417	12.475	9.707	7.729	6.282	5.217	4.401	3.991	3.750	3.542
12	SF-24H-bus-1500	1500	1.05	4380	24-hour	business		9.39	0.480	6.992	9.304	9.391	9.068	7.997	6.837	5.802	4.933	4.219	3.638	3.164	2.773	2.447
13	SF-ann50-all-500d	500	1.1	50	annual	all	downwind	0.037	3.74E-03	3.11E-02	3.73E-02	3.19E-02	2.54E-02	2.01E-02	1.62E-02	1.33E-02	1.12E-02	9.66E-03	8.47E-03	7.52E-03	6.76E-03	6.12E-03
	SF-ann50-all-500u	500	1.1	50	annual	all	upwind	0.005	6.02E-05	2.17E-03	4.41E-03	5.09E-03	4.84E-03	4.29E-03	3.73E-03	3.25E-03	2.85E-03	2.52E-03	2.25E-03	2.03E-03	1.84E-03	1.68E-03
14	SF-ann100-all-500d	500	1.1	100	annual	all	downwind	0.075	7.47E-03	6.23E-02	7.47E-02	6.39E-02	5.08E-02	4.02E-02	3.23E-02	2.66E-02	2.24E-02	1.93E-02	1.69E-02	1.50E-02	1.35E-02	1.22E-02
	SF-ann100-all-500u	500	1.1	100	annual	all	upwind	0.010	1.20E-04	4.33E-03	8.82E-03	1.02E-02	9.68E-03	8.59E-03	7.46E-03	6.50E-03	5.70E-03	5.05E-03	4.51E-03	4.06E-03	3.68E-03	3.36E-03
15	SF-ann200-all-500d	500	1.1	200	annual	all	downwind	0.149	1.49E-02	1.25E-01	1.49E-01	1.28E-01	1.02E-01	8.04E-02	6.47E-02	5.32E-02	4.49E-02	3.86E-02	3.39E-02	3.01E-02	2.70E-02	2.45E-02
	SF-ann200-all-500u	500	1.1	200	annual	all	upwind	0.020	2.41E-04	8.66E-03	1.76E-02	2.04E-02	1.94E-02	1.72E-02	1.49E-02	1.30E-02	1.14E-02	1.01E-02	9.02E-03	8.12E-03	7.37E-03	6.72E-03
16	SF-ann500-all-500d	500	1.1	500	annual	all	downwind	0.373	3.74E-02	3.11E-01	3.73E-01	3.19E-01	2.54E-01	2.01E-01	1.62E-01	1.33E-01	1.12E-01	9.66E-02	8.47E-02	7.52E-02	6.76E-02	6.12E-02
	SF-ann500-all-500u	500	1.1	500	annual	all	upwind	0.051	6.02E-04	2.17E-02	4.41E-02	5.09E-02	4.84E-02	4.29E-02	3.73E-02	3.25E-02	2.85E-02	2.52E-02	2.25E-02	2.03E-02	1.84E-02	1.68E-02
17	SF-ann1000-all-500d	500	1.1	1000	annual	all	downwind	0.747	7.47E-02	6.23E-01	7.47E-01	6.39E-01	5.08E-01	4.02E-01	3.23E-01	2.66E-01	2.24E-01	1.93E-01	1.69E-01	1.50E-01	1.35E-01	1.22E-01
	SF-ann1000-all-500u	500	1.1	1000	annual	all	upwind	0.102	1.20E-03	4.33E-02	8.82E-02	1.02E-01	9.68E-02	8.59E-02	7.46E-02	6.50E-02	5.70E-02	5.05E-02	4.51E-02	4.06E-02	3.68E-02	3.36E-02
18	SF-ann50-all-1500d	1500	1.05	50	annual	all	downwind	0.011	1.85E-05	2.01E-03	6.82E-03	1.00E-02	1.08E-02	1.03E-02	9.32E-03	8.28E-03	7.32E-03	6.49E-03	5.79E-03	5.20E-03	4.71E-03	4.30E-03
	SF-ann50-all-1500u	1500	1.05	50	annual	all	upwind	0.001	0.00E+00	3.17E-05	2.55E-04	6.24E-04	9.44E-04	1.14E-03	1.24E-03	1.26E-03	1.24E-03	1.20E-03	1.15E-03	1.08E-03	1.02E-03	9.65E-04
19	SF-ann100-all-1500d	1500	1.05	100	annual	all	downwind	0.022	3.70E-05	4.02E-03	1.36E-02	2.00E-02	2.16E-02	2.06E-02	1.86E-02	1.66E-02	1.46E-02	1.30E-02	1.16E-02	1.04E-02	9.43E-03	8.60E-03
	SF-ann100-all-1500u	1500	1.05	100	annual	all	upwind	0.003	0.00E+00	6.35E-05	5.10E-04	1.25E-03	1.89E-03	2.29E-03	2.48E-03	2.53E-03	2.49E-03	2.40E-03	2.29E-03	2.17E-03	2.05E-03	1.93E-03
20	SF-ann200-all-1500d	1500	1.05	200	annual	all	downwind	0.043	7.40E-05	8.05E-03	2.73E-02	4.01E-02	4.31E-02	4.11E-02	3.73E-02	3.31E-02	2.93E-02	2.60E-02	2.32E-02	2.08E-02	1.89E-02	1.72E-02
	SF-ann200-all-1500u	1500	1.05	200	annual	all	upwind	0.005	0.00E+00	1.27E-04	1.02E-03	2.50E-03	3.78E-03	4.58E-03	4.96E-03	5.05E-03	4.98E-03	4.80E-03	4.58E-03	4.34E-03	4.09E-03	3.86E-03
21	SF-ann500-all-1500d	1500	1.05	500	annual	all	downwind	0.108	1.85E-04	2.01E-02	6.82E-02	1.00E-01	1.08E-01	1.03E-01	9.32E-02	8.28E-02	7.32E-02	6.49E-02	5.79E-02	5.20E-02	4.71E-02	4.30E-02
	SF-ann5400-all-1500u	1500	1.05	500	annual	all	upwind	0.013	0.00E+00	3.17E-04	2.55E-03	6.24E-03	9.44E-03	1.14E-02	1.24E-02	1.26E-02	1.24E-02	1.20E-02	1.15E-02	1.08E-02	1.02E-02	9.65E-03
22	SF-ann1000-all-1500d	1500	1.05	1000	annual	all	downwind	0.216	3.70E-04	4.02E-02	1.36E-01	2.00E-01	2.16E-01	2.06E-01	1.86E-01	1.66E-01	1.46E-01	1.30E-01	1.16E-01	1.04E-01	9.43E-02	8.60E-02
	SF-ann1000-all-1500u	1500	1.05	1000	annual	all	upwind	0.025	0.00E+00	6.35E-04	5.10E-03	1.25E-02	1.89E-02	2.29E-02	2.48E-02	2.53E-02	2.49E-02	2.40E-02	2.29E-02	2.17E-02	2.05E-02	1.93E-02
23	SF-ann-50-sum-500d	500	1.1	50	annual	summer	downwind	0.104	1.86E-02	1.04E-01	9.94E-02	7.46E-02	5.48E-02	4.12E-02	3.18E-02	2.51E-02	2.03E-02	1.68E-02	1.40E-02	1.19E-02	1.02E-02	8.90E-03
	SF-ann-50-sum-500u	500	1.1	50	annual	summer	upwind	0.001	1.92E-05	4.26E-04	6.74E-04	6.54E-04	5.55E-04	4.55E-04	3.72E-04	3.06E-04	2.55E-04	2.14E-04	1.82E-04	1.56E-04	1.36E-04	1.18E-04
24	SF-ann-100-sum-500d	500	1.1	100	annual	summer	downwind	0.209	3.72E-02	2.09E-01	1.99E-01	1.49E-01	1.10E-01	8.24E-02	6.35E-02	5.03E-02	4.07E-02	3.35E-02	2.81E-02	2.38E-02	2.05E-02	1.78E-02
	SF-ann-100-sum-500u	500	1.1	100	annual	summer	upwind	0.001	3.84E-05	8.53E-04	1.35E-03	1.31E-03	1.11E-03	9.11E-04	7.45E-04	6.13E-04	5.10E-04	4.29E-04	3.64E-04	3.13E-04	2.71E-04	2.37E-04
25	SF-ann-200-sum-500d	500	1.1	200	annual	summer	downwind	0.418	7.44E-02	4.18E-01	3.98E-01	2.98E-01	2.19E-01	1.65E-01	1.27E-01	1.01E-01	8.13E-02	6.70E-02	5.61E-02	4.77E-02	4.10E-02	3.56E-02
	SF-ann-200-sum-500u	500	1.1	200	annual	summer	upwind	0.003	7.67E-05	1.71E-03	2.69E-03	2.62E-03	2.22E-03	1.82E-03	1.49E-03	1.23E-03	1.02E-03	8.58E-04	7.29E-04	6.26E-04	5.42E-04	4.74E-04
26	SF-ann-500-sum-500d	500	1.1	500	annual	summer	downwind	1.044	1.86E-01	1.04E+00	9.94E-01	7.46E-01	5.48E-01	4.12E-01	3.18E-01	2.51E-01	2.03E-01	1.68E-01	1.40E-01	1.19E-01	1.02E-01	8.90E-02
	SF-ann-500-sum-500u	500	1.1	500	annual	summer	upwind	0.007	1.92E-04	4.26E-03	6.74E-03	6.54E-03	5.55E-03	4.55E-03	3.72E-03	3.06E-03	2.55E-03	2.14E-03	1.82E-03	1.56E-03	1.36E-03	1.18E-03
27	SF-ann-50-sum-1500d	1500	1.05	50	annual	summer	downwind	0.034	9.95E-05	1.06E-02	2.86E-02	3.44E-02	3.21E-02	2.77E-02	2.33E-02	1.95E-02	1.64E-02	1.39E-02	1.19E-02	1.03E-02	8.99E-03	7.90E-03
	SF-ann-50-sum-1500u	1500	1.05	50	annual	summer	upwind	0.000	0.00E+00	3.42E-06	4.11E-05	1.04E-04	1.47E-04	1.64E-04	1.64E-04	1.56E-04	1.44E-04	1.31E-04	1.19E-04	1.07E-04	9.68E-05	8.77E-05
28	SF-ann-100-sum-1500d	1500	1.05	100	annual	summer	downwind	0.069	1.99E-04	2.12E-02	5.73E-02	6.88E-02	6.43E-02	5.54E-02	4.66E-02	3.90E-02	3.28E-02	2.79E-02	2.39E-02	2.06E-02	1.80E-02	1.58E-02
	SF-ann-100-sum-1500u	1500	1.05	100	annual	summer	upwind	0.000	0.00E+00	6.85E-06	8.22E-05	2.08E-04	2.94E-04	3.28E-04	3.29E-04	3.12E-04	2.89E-04	2.63E-04	2.38E-04	2.15E-04	1.94E-04	1.75E-04
29	SF-ann-200-sum-1500d	1500	1.05	200	annual	summer	downwind	0.138	3.98E-04	4.24E-02	1.15E-01	1.38E-01	1.29E-01	1.11E-01	9.31E-02	7.80E-02	6.57E-02	5.57E-02	4.77E-02	4.13E-02	3.60E-02	3.16E-02
	SF-ann-200-sum-1500u	1500	1.05	200	annual	summer	upwind	0.001	0.00E+00	1.37E-05	1.64E-04	4.16E-04	5.88E-04	6.57E-04	6.58E-04	6.25E-04	5.77E-04	5.25E-04	4.76E-04	4.29E-04	3.87E-04	3.51E-04
30	SF-ann-500-sum-1500d	1500	1.05	500	annual	summer	downwind	0.344	9.95E-04	1.06E-01	2.86E-01	3.44E-01	3.21E-01	2.77E-01	2.33E-01	1.95E-01	1.64E-01	1.39E-01	1.19E-01	1.03E-01	8.99E-02	7.90E-02
	SF-ann-500-sum-1500u	1500	1.05	500	annual	summer	upwind	0.002	0.00E+00	3.42E-05	4.11E-04	1.04E-03	1.47E-03	1.64E-03	1.64E-03	1.56E-03	1.44E-03	1.31E-03	1.19E-03	1.07E-03	9.68E-04	8.77E-04
31	SF-ann-50-bus-500d	500	1.1	50	annual	business	downwind	0.053	7.07E-03	4.87E-02	5.27E-02	4.27E-02	3.29E-02	2.54E-02	2.00E-02	1.61E-02	1.32E-02	1.10E-02	9.31E-03	7.98E-03	6.91E-03	6.05E-03
	SF-ann-50-bus-500u	500	1.1	50	annual	business	upwind	0.006	6.45E-05	2.55E-03	5.31E-03	6.29E-03	6.07E-03	5.43E-03	4.72E-03	4.08E-03	3.54E-03	3.08E-03	2.70E-03	2.39E-03	2.12E-03	1.90E-03
32	SF-ann-100-bus-500d	500	1.1	100	annual	business	downwind	0.105	1.41E-02	9.74E-02	1.05E-01	8.54E-02	6.57E-02	5.09E-02	4.01E-02	3.22E-02	2.64E-02	2.20E-02	1.86E-02	1.60E-02	1.38E-02	1.21E-02
	SF-ann-100-bus-500u	500	1.1	100	annual	business	upwind	0.013	1.29E-04	5.10E-03	1.06E-02	1.26E-02	1.21E-02	1.09E-02	9.43E-03	8.16E-03	7.07E-03	6.16E-03	5.40E-03	4.77E-03	4.24E-03	3.80E-03
33	SF-ann-200-bus-500d	500	1.1	200	annual	business	downwind	0.211	2.83E-02	1.95E-01	2.11E-01	1.71E-01	1.31E-01	1.02E-01	8.02E-02	6.45E-02	5.28E-02	4.40E-02	3.72E-02	3.19E-02	2.76E-02	2.42E-02
	SF-ann-200-bus-500u	500	1.1	200	annual	business	upwind	0.025	2.58E-04	1.02E-02	2.12E-02	2.52E-02	2.43E-02	2.17E-02	1.89E-02	1.63E-02	1.41E-02	1.23E-02	1.08E-02	9.55E-03	8.49E-03	7.59E-03
34	SF-ann-500-bus-500d	500	1.1	500	annual	business	downwind	0.527	7.07E-02	4.87E-01	5.27E-01	4.27E-01	3.29E-01	2.54E-01	2.00E-01	1.61E-01	1.32E-01	1.10E-01	9.31E-02	7.98E-02	6.91E-02	6.05E-02
	SF-ann-500-bus-500u	500	1.1	500	annual	business	upwind	0.063	6.45E-04	2.55E-02	5.31E-02	6.29E-02	6.07E-02	5.43E-02	4.72E-02	4.08E-02	3.54E-02	3.08E-02	2.70E-02	2.39E-02	2.12E-02	1.90E-02
35	SF-ann-1000-bus-500d	500	1.1	1000	annual	business	downwind	1.055	1.41E-01	9.74E-01	1.05E+00	8.54E-01	6.57E-01	5.09E-01	4.01E-01	3.22E-01	2.64E-01	2.20E-01	1.86E-01	1.60E-01	1.38E-01	1.21E-01
	SF-ann-1000-bus-500u	500	1.1	1000	annual	business	upwind	0.126	1.29E-03	5.10E-02	1.06E-01	1.26E-01	1.21E-01	1.09E-01	9.43E-02	8.16E-02	7.07E-02	6.16E-02	5.40E-02	4.77E-02	4.24E-02	3.80E-02
36	SF-ann-50-bus-1500d	1500	1.05	50	annual	business	downwind	0.016	3.69E-05	3.79E-03	1.16E-02	1.56E-02	1.58E-02	1.45E-02	1.27E-02	1.10E-02	9.52E-03	8.26E-03	7.20E-03	6.32E-03	5.58E-03	4.95E-03
	SF-ann-50-bus-1500u	1500	1.05	50	annual	business	upwind	0.002	0.00E+00	2.57E-05	2.62E-04	6.89E-04	1.08E-03	1.33E-03	1.47E-03	1.51E-03	1.49E-03	1.44E-03	1.37E-03	1.29E-03	1.21E-03	1.13E-03
37	SF-ann-100-bus-1500d	1500	1.05	100	annual	business	downwind	0.032	7.37E-05	7.58E-03	2.32E-02	3.12E-02	3.17E-02	2.90E-02	2.54E-02	2.20E-02	1.90E-02	1.65E-02	1.44E-02	1.26E-02	1.12E-02	9.91E-03
	SF-ann-100-bus-1500u	1500	1.05	100	annual	business	upwind	0.003	0.00E+00	5.14E-05	5.24E-04	1.38E-03	2.15E-03	2.66E-03	2.93E-03	3.02E-03	2.98E-03	2.88E-03	2.74E-03	2.58E-03	2.42E-03	2.26E-03
38	SF-ann-200-bus-1500d	1500	1.05	200	annual	business	downwind	0.063	1.47E-04	1.52E-02	4.64E-02	6.25E-02	6.34E-02	5.79E-02	5.09E-02	4.41E-02	3.81E-02	3.30E-02	2.88E-02	2.53E-02	2.23E-02	1.98E-02
	SF-ann-200-bus-1500u	1500	1.05	200	annual	business	upwind	0.006	0.00E+00	1.03E-04	1.05E-03	2.76E-03	4.30E-03	5.33E-03	5.86E-03	6.03E-03	5.97E-03	5.76E-03	5.48E-03	5.16E-03	4.83E-03	4.52E-03
39	SF-ann-500-bus-1500d	1500	1.05	500	annual	business	downwind	0.158	3.69E-04	3.79E-02	1.16E-01	1.56E-01	1.58E-01	1.45E-01	1.27E-01	1.10E-01	9.52E-02	8.26E-02	7.20E-02	6.32E-02	5.58E-02	4.95E-02
	SF-ann-500-bus-1500u	1500	1.05	500	annual	business	upwind	0.015	0.00E+00	2.57E-04	2.62E-03	6.89E-03	1.08E-02	1.33E-02	1.47E-02	1.51E-02	1.49E-02	1.44E-02	1.37E-02	1.29E-02	1.21E-02	1.13E-02
40	SF-ann-1000-bus-1500d	1500	1.05	1000	annual	business	downwind	0.317	7.37E-04	7.58E-02	2.32E-01	3.12E-01	3.17E-01	2.90E-01	2.54E-01	2.20E-01	1.90E-01	1.65E-01	1.44E-01	1.26E-01	1.12E-01	9.91E-02
	SF-ann-1000-bus-1500u	1500	1.05	1000	annual	business	upwind	0.030	0.00E+00	5.14E-04	5.24E-03	1.38E-02	2.15E-02	2.66E-02	2.93E-02	3.02E-02	2.98E-02	2.88E-02	2.74E-02	2.58E-02	2.42E-02	2.26E-02

*The distance downwind from the BUG represents the distance along a diagonal line in a coordinate grid.

Model Run number	**Name**	212	226	240	255	269	283	424	566	707	849	990	1131	1273	1414	1556	1697	1838	1980	2121	2263	2404	2546
1	SF-1H-all-500	19.552	18.499	17.820	17.260	17.679	17.962	16.625	13.373	10.665	8.657	7.178	6.070	5.222	4.558	4.028	3.597	3.242	2.945	2.694	2.478	2.292	2.130
2	SF-1H-all-1500	10.732	10.073	9.491	8.973	8.509	8.091	8.371	8.139	7.257	6.324	5.503	4.817	4.252	3.785	3.398	3.073	2.798	2.564	2.362	2.187	2.034	1.900
3	SF-1H-sum-500	11.969	10.738	9.683	8.772	7.983	7.294	3.521	2.087	1.393	1.005	0.764	0.604	0.492	0.410	0.349	0.301	0.263	0.232	0.207	0.186	0.169	0.154
4	SF-1H-sum-1500	7.860	7.289	6.758	6.270	5.823	5.416	2.983	1.857	1.269	0.927	0.711	0.565	0.462	0.386	0.329	0.284	0.249	0.220	0.196	0.177	0.160	0.146
5	SF-1H-bus-500	19.552	18.499	17.820	17.088	17.010	17.274	15.935	12.785	10.173	8.239	6.816	5.751	4.937	4.300	3.792	3.379	3.039	2.754	2.514	2.308	2.130	1.975
6	SF-1H-bus-1500	10.732	10.073	9.491	8.973	8.509	8.091	8.034	7.788	6.926	6.021	5.227	4.565	4.020	3.571	3.199	2.887	2.623	2.398	2.205	2.037	1.891	1.762
7	SF-24H-all-500	4.794	4.259	3.864	3.540	3.252	2.997	1.770	1.180	0.849	0.643	0.507	0.412	0.347	0.300	0.262	0.232	0.208	0.188	0.171	0.156	0.144	0.133
8	SF-24H-all-1500	3.894	3.517	3.190	2.905	2.656	2.436	1.319	0.934	0.696	0.542	0.437	0.360	0.305	0.266	0.235	0.209	0.188	0.171	0.156	0.144	0.133	0.123
9	SF-24H-sum-500	1.462	1.295	1.156	1.038	0.938	0.852	0.398	0.233	0.155	0.112	0.085	0.067	0.055	0.046	0.039	0.033	0.029	0.026	0.023	0.021	0.019	0.012
10	SF-24H-sum-1500	1.293	1.156	1.040	0.939	0.853	0.778	0.372	0.220	0.147	0.106	0.081	0.064	0.052	0.043	0.037	0.032	0.028	0.025	0.022	0.020	0.018	0.011
11	SF-24H-bus-500	3.361	3.199	3.053	2.919	2.795	2.679	1.820	1.313	0.997	0.790	0.646	0.542	0.465	0.405	0.358	0.321	0.290	0.264	0.242	0.224	0.208	0.194
12	SF-24H-bus-1500	2.174	1.943	1.747	1.579	1.453	1.424	1.148	0.925	0.755	0.626	0.530	0.456	0.398	0.352	0.315	0.285	0.259	0.238	0.219	0.203	0.189	0.177
13	SF-ann50-all-500d	5.59E-03	5.12E-03	4.72E-03	4.37E-03	4.06E-03	3.78E-03	2.09E-03	1.33E-03	9.29E-04	6.88E-04	5.32E-04	4.26E-04	3.50E-04	2.94E-04	2.51E-04	2.17E-04	1.91E-04	1.69E-04	1.51E-04	1.36E-04	1.24E-04	1.13E-04
	SF-ann50-all-500u	1.54E-03	1.42E-03	1.32E-03	1.22E-03	1.14E-03	1.07E-03	6.05E-04	3.92E-04	2.76E-04	2.05E-04	1.60E-04	1.29E-04	1.06E-04	8.98E-05	7.72E-05	6.72E-05	5.93E-05	5.29E-05	4.75E-05	4.30E-05	3.93E-05	3.60E-05
14	SF-ann100-all-500d	1.12E-02	1.02E-02	9.45E-03	8.75E-03	8.12E-03	7.57E-03	4.19E-03	2.67E-03	1.86E-03	1.38E-03	1.06E-03	8.52E-04	7.00E-04	5.87E-04	5.02E-04	4.35E-04	3.81E-04	3.38E-04	3.02E-04	2.73E-04	2.48E-04	2.26E-04
	SF-ann100-all-500u	3.09E-03	2.84E-03	2.63E-03	2.45E-03	2.28E-03	2.13E-03	1.21E-03	7.83E-04	5.51E-04	4.11E-04	3.20E-04	2.58E-04	2.13E-04	1.80E-04	1.54E-04	1.34E-04	1.19E-04	1.06E-04	9.50E-05	8.61E-05	7.85E-05	7.20E-05
15	SF-ann200-all-500d	2.23E-02	2.05E-02	1.89E-02	1.75E-02	1.62E-02	1.51E-02	8.38E-03	5.34E-03	3.72E-03	2.75E-03	2.13E-03	1.70E-03	1.40E-03	1.17E-03	1.00E-03	8.69E-04	7.63E-04	6.76E-04	6.05E-04	5.45E-04	4.95E-04	4.52E-04
	SF-ann200-all-500u	6.17E-03	5.69E-03	5.27E-03	4.89E-03	4.56E-03	4.26E-03	2.42E-03	1.57E-03	1.10E-03	8.22E-04	6.40E-04	5.15E-04	4.26E-04	3.59E-04	3.09E-04	2.69E-04	2.37E-04	2.11E-04	1.90E-04	1.72E-04	1.57E-04	1.44E-04
16	SF-ann500-all-500d	5.59E-02	5.12E-02	4.72E-02	4.37E-02	4.06E-02	3.78E-02	2.09E-02	1.33E-02	9.29E-03	6.88E-03	5.32E-03	4.26E-03	3.50E-03	2.94E-03	2.51E-03	2.17E-03	1.91E-03	1.69E-03	1.51E-03	1.36E-03	1.24E-03	1.13E-03
	SF-ann500-all-500u	1.54E-02	1.42E-02	1.32E-02	1.22E-02	1.14E-02	1.07E-02	6.05E-03	3.92E-03	2.76E-03	2.05E-03	1.60E-03	1.29E-03	1.06E-03	8.98E-04	7.72E-04	6.72E-04	5.93E-04	5.29E-04	4.75E-04	4.30E-04	3.93E-04	3.60E-04
17	SF-ann1000-all-500d	1.12E-01	1.02E-01	9.45E-02	8.75E-02	8.12E-02	7.57E-02	4.19E-02	2.67E-02	1.86E-02	1.38E-02	1.06E-02	8.52E-03	7.00E-03	5.87E-03	5.02E-03	4.35E-03	3.81E-03	3.38E-03	3.02E-03	2.73E-03	2.48E-03	2.26E-03
	SF-ann1000-all-500u	3.09E-02	2.84E-02	2.63E-02	2.45E-02	2.28E-02	2.13E-02	1.21E-02	7.83E-03	5.51E-03	4.11E-03	3.20E-03	2.58E-03	2.13E-03	1.80E-03	1.54E-03	1.34E-03	1.19E-03	1.06E-03	9.50E-04	8.61E-04	7.85E-04	7.20E-04
18	SF-ann50-all-1500d	3.94E-03	3.64E-03	3.38E-03	3.15E-03	2.95E-03	2.76E-03	1.63E-03	1.09E-03	7.87E-04	5.95E-04	4.68E-04	3.79E-04	3.14E-04	2.66E-04	2.28E-04	1.99E-04	1.75E-04	1.56E-04	1.40E-04	1.26E-04	1.15E-04	1.05E-04
	SF-ann50-all-1500u	9.11E-04	8.61E-04	8.15E-04	7.72E-04	7.33E-04	6.96E-04	4.44E-04	3.08E-04	2.26E-04	1.74E-04	1.38E-04	1.13E-04	9.43E-05	8.03E-05	6.95E-05	6.09E-05	5.40E-05	4.83E-05	4.36E-05	3.96E-05	3.62E-05	3.33E-05
19	SF-ann100-all-1500d	7.89E-03	7.28E-03	6.76E-03	6.30E-03	5.89E-03	5.53E-03	3.27E-03	2.19E-03	1.57E-03	1.19E-03	9.36E-04	7.58E-04	6.29E-04	5.31E-04	4.57E-04	3.97E-04	3.50E-04	3.11E-04	2.79E-04	2.52E-04	2.30E-04	2.10E-04
	SF-ann100-all-1500u	1.82E-03	1.72E-03	1.63E-03	1.54E-03	1.47E-03	1.39E-03	8.88E-04	6.15E-04	4.52E-04	3.47E-04	2.76E-04	2.26E-04	1.89E-04	1.61E-04	1.39E-04	1.22E-04	1.08E-04	9.66E-05	8.72E-05	7.92E-05	7.25E-05	6.67E-05
20	SF-ann200-all-1500d	1.58E-02	1.46E-02	1.35E-02	1.26E-02	1.18E-02	1.11E-02	6.54E-03	4.37E-03	3.15E-03	2.38E-03	1.87E-03	1.52E-03	1.26E-03	1.06E-03	9.13E-04	7.95E-04	7.00E-04	6.23E-04	5.58E-04	5.05E-04	4.59E-04	4.20E-04
	SF-ann200-all-1500u	3.65E-03	3.45E-03	3.26E-03	3.09E-03	2.93E-03	2.78E-03	1.78E-03	1.23E-03	9.04E-04	6.94E-04	5.52E-04	4.51E-04	3.77E-04	3.21E-04	2.78E-04	2.44E-04	2.16E-04	1.93E-04	1.74E-04	1.58E-04	1.45E-04	1.33E-04
21	SF-ann500-all-1500d	3.94E-02	3.64E-02	3.38E-02	3.15E-02	2.95E-02	2.76E-02	1.63E-02	1.09E-02	7.87E-03	5.95E-03	4.68E-03	3.79E-03	3.14E-03	2.66E-03	2.28E-03	1.99E-03	1.75E-03	1.56E-03	1.40E-03	1.26E-03	1.15E-03	1.05E-03
	SF-ann5400-all-1500u	9.11E-03	8.61E-03	8.15E-03	7.72E-03	7.33E-03	6.96E-03	4.44E-03	3.08E-03	2.26E-03	1.74E-03	1.38E-03	1.13E-03	9.43E-04	8.03E-04	6.95E-04	6.09E-04	5.40E-04	4.83E-04	4.36E-04	3.96E-04	3.62E-04	3.33E-04
22	SF-ann1000-all-1500d	7.89E-02	7.28E-02	6.76E-02	6.30E-02	5.89E-02	5.53E-02	3.27E-02	2.19E-02	1.57E-02	1.19E-02	9.36E-03	7.58E-03	6.29E-03	5.31E-03	4.57E-03	3.97E-03	3.50E-03	3.11E-03	2.79E-03	2.52E-03	2.30E-03	2.10E-03
	SF-ann1000-all-1500u	1.82E-02	1.72E-02	1.63E-02	1.54E-02	1.47E-02	1.39E-02	8.88E-03	6.15E-03	4.52E-03	3.47E-03	2.76E-03	2.26E-03	1.89E-03	1.61E-03	1.39E-03	1.22E-03	1.08E-03	9.66E-04	8.72E-04	7.92E-04	7.25E-04	6.67E-04
23	SF-ann-50-sum-500d	7.81E-03	6.90E-03	6.14E-03	5.50E-03	4.96E-03	4.49E-03	2.06E-03	1.18E-03	7.73E-04	5.47E-04	4.09E-04	3.18E-04	2.56E-04	2.11E-04	1.78E-04	1.52E-04	1.32E-04	1.16E-04	1.03E-04	9.25E-05	8.38E-05	7.65E-05
	SF-ann-50-sum-500u	1.04E-04	9.25E-05	8.26E-05	7.40E-05	6.69E-05	6.05E-05	2.74E-05	1.55E-05	1.00E-05	6.85E-06	5.02E-06	3.88E-06	3.20E-06	2.51E-06	2.28E-06	1.83E-06	1.60E-06	1.60E-06	1.37E-06	1.14E-06	1.14E-06	9.13E-07
24	SF-ann-100-sum-500d	1.56E-02	1.38E-02	1.23E-02	1.10E-02	9.92E-03	8.99E-03	4.11E-03	2.37E-03	1.55E-03	1.09E-03	8.18E-04	6.37E-04	5.12E-04	4.22E-04	3.55E-04	3.04E-04	2.64E-04	2.32E-04	2.06E-04	1.85E-04	1.68E-04	1.53E-04
	SF-ann-100-sum-500u	2.09E-04	1.85E-04	1.65E-04	1.48E-04	1.34E-04	1.21E-04	5.48E-05	3.11E-05	2.01E-05	1.37E-05	1.00E-05	7.76E-06	6.39E-06	5.02E-06	4.57E-06	3.65E-06	3.20E-06	3.20E-06	2.74E-06	2.28E-06	2.28E-06	1.83E-06
25	SF-ann-200-sum-500d	3.12E-02	2.76E-02	2.46E-02	2.20E-02	1.98E-02	1.80E-02	8.23E-03	4.73E-03	3.09E-03	2.19E-03	1.64E-03	1.27E-03	1.02E-03	8.44E-04	7.11E-04	6.07E-04	5.28E-04	4.64E-04	4.13E-04	3.70E-04	3.35E-04	3.06E-04
	SF-ann-200-sum-500u	4.17E-04	3.70E-04	3.31E-04	2.96E-04	2.68E-04	2.42E-04	1.10E-04	6.21E-05	4.02E-05	2.74E-05	2.01E-05	1.55E-05	1.28E-05	1.00E-05	9.13E-06	7.31E-06	6.39E-06	6.39E-06	5.48E-06	4.57E-06	4.57E-06	3.65E-06
26	SF-ann-500-sum-500d	7.81E-02	6.90E-02	6.14E-02	5.50E-02	4.96E-02	4.49E-02	2.06E-02	1.18E-02	7.73E-03	5.47E-03	4.09E-03	3.18E-03	2.56E-03	2.11E-03	1.78E-03	1.52E-03	1.32E-03	1.16E-03	1.03E-03	9.25E-04	8.38E-04	7.65E-04
	SF-ann-500-sum-500u	1.04E-03	9.25E-04	8.26E-04	7.40E-04	6.69E-04	6.05E-04	2.74E-04	1.55E-04	1.00E-04	6.85E-05	5.02E-05	3.88E-05	3.20E-05	2.51E-05	2.28E-05	1.83E-05	1.60E-05	1.60E-05	1.37E-05	1.14E-05	1.14E-05	9.13E-06
27	SF-ann-50-sum-1500d	6.99E-03	6.22E-03	5.57E-03	5.02E-03	4.55E-03	4.13E-03	1.93E-03	1.12E-03	7.33E-04	5.19E-04	3.89E-04	3.03E-04	2.44E-04	2.01E-04	1.69E-04	1.45E-04	1.26E-04	1.11E-04	9.84E-05	8.84E-05	7.99E-05	7.28E-05
	SF-ann-50-sum-1500u	7.95E-05	7.21E-05	6.55E-05	6.00E-05	5.48E-05	5.05E-05	2.47E-05	1.44E-05	9.36E-06	6.39E-06	4.79E-06	3.65E-06	2.97E-06	2.51E-06	2.05E-06	1.83E-06	1.60E-06	1.37E-06	1.37E-06	1.14E-06	1.14E-06	9.13E-07
28	SF-ann-100-sum-1500d	1.40E-02	1.24E-02	1.11E-02	1.00E-02	9.09E-03	8.27E-03	3.86E-03	2.24E-03	1.47E-03	1.04E-03	7.78E-04	6.06E-04	4.88E-04	4.02E-04	3.38E-04	2.89E-04	2.52E-04	2.21E-04	1.97E-04	1.77E-04	1.60E-04	1.46E-04
	SF-ann-100-sum-1500u	1.59E-04	1.44E-04	1.31E-04	1.20E-04	1.10E-04	1.01E-04	4.93E-05	2.88E-05	1.87E-05	1.28E-05	9.59E-06	7.31E-06	5.94E-06	5.02E-06	4.11E-06	3.65E-06	3.20E-06	2.74E-06	2.74E-06	2.28E-06	2.28E-06	1.83E-06
29	SF-ann-200-sum-1500d	2.79E-02	2.49E-02	2.23E-02	2.01E-02	1.82E-02	1.65E-02	7.72E-03	4.47E-03	2.93E-03	2.08E-03	1.56E-03	1.21E-03	9.75E-04	8.05E-04	6.77E-04	5.79E-04	5.03E-04	4.43E-04	3.94E-04	3.53E-04	3.20E-04	2.91E-04
	SF-ann-200-sum-1500u	3.18E-04	2.89E-04	2.62E-04	2.40E-04	2.19E-04	2.02E-04	9.86E-05	5.75E-05	3.74E-05	2.56E-05	1.92E-05	1.46E-05	1.19E-05	1.00E-05	8.22E-06	7.31E-06	6.39E-06	5.48E-06	5.48E-06	4.57E-06	4.57E-06	3.65E-06
30	SF-ann-500-sum-1500d	6.99E-02	6.22E-02	5.57E-02	5.02E-02	4.55E-02	4.13E-02	1.93E-02	1.12E-02	7.33E-03	5.19E-03	3.89E-03	3.03E-03	2.44E-03	2.01E-03	1.69E-03	1.45E-03	1.26E-03	1.11E-03	9.84E-04	8.84E-04	7.99E-04	7.28E-04
	SF-ann-500-sum-1500u	7.95E-04	7.21E-04	6.55E-04	6.00E-04	5.48E-04	5.05E-04	2.47E-04	1.44E-04	9.36E-05	6.39E-05	4.79E-05	3.65E-05	2.97E-05	2.51E-05	2.05E-05	1.83E-05	1.60E-05	1.37E-05	1.37E-05	1.14E-05	1.14E-05	9.13E-06
31	SF-ann-50-bus-500d	5.34E-03	4.74E-03	4.25E-03	3.83E-03	3.46E-03	3.15E-03	1.49E-03	8.71E-04	5.76E-04	4.11E-04	3.10E-04	2.43E-04	1.96E-04	1.63E-04	1.38E-04	1.19E-04	1.04E-04	9.16E-05	8.17E-05	7.37E-05	6.70E-05	6.13E-05
	SF-ann-50-bus-500u	1.71E-03	1.55E-03	1.41E-03	1.28E-03	1.18E-03	1.08E-03	5.55E-04	3.40E-04	2.31E-04	1.69E-04	1.29E-04	1.03E-04	8.48E-05	7.15E-05	6.13E-05	5.34E-05	4.73E-05	4.22E-05	3.81E-05	3.47E-05	3.18E-05	2.93E-05
32	SF-ann-100-bus-500d	1.07E-02	9.49E-03	8.50E-03	7.65E-03	6.93E-03	6.31E-03	2.98E-03	1.74E-03	1.15E-03	8.22E-04	6.19E-04	4.86E-04	3.93E-04	3.26E-04	2.76E-04	2.37E-04	2.07E-04	1.83E-04	1.63E-04	1.47E-04	1.34E-04	1.23E-04
	SF-ann-100-bus-500u	3.42E-03	3.09E-03	2.81E-03	2.57E-03	2.36E-03	2.17E-03	1.11E-03	6.79E-04	4.62E-04	3.37E-04	2.59E-04	2.07E-04	1.70E-04	1.43E-04	1.23E-04	1.07E-04	9.45E-05	8.45E-05	7.63E-05	6.94E-05	6.37E-05	5.87E-05
33	SF-ann-200-bus-500d	2.13E-02	1.90E-02	1.70E-02	1.53E-02	1.39E-02	1.26E-02	5.95E-03	3.49E-03	2.30E-03	1.64E-03	1.24E-03	9.71E-04	7.86E-04	6.52E-04	5.52E-04	4.75E-04	4.15E-04	3.66E-04	3.27E-04	2.95E-04	2.68E-04	2.45E-04
	SF-ann-200-bus-500u	6.83E-03	6.18E-03	5.62E-03	5.14E-03	4.71E-03	4.34E-03	2.22E-03	1.36E-03	9.24E-04	6.74E-04	5.18E-04	4.13E-04	3.39E-04	2.86E-04	2.45E-04	2.14E-04	1.89E-04	1.69E-04	1.53E-04	1.39E-04	1.27E-04	1.17E-04
34	SF-ann-500-bus-500d	5.34E-02	4.74E-02	4.25E-02	3.83E-02	3.46E-02	3.15E-02	1.49E-02	8.71E-03	5.76E-03	4.11E-03	3.10E-03	2.43E-03	1.96E-03	1.63E-03	1.38E-03	1.19E-03	1.04E-03	9.16E-04	8.17E-04	7.37E-04	6.70E-04	6.13E-04
	SF-ann-500-bus-500u	1.71E-02	1.55E-02	1.41E-02	1.28E-02	1.18E-02	1.08E-02	5.55E-03	3.40E-03	2.31E-03	1.69E-03	1.29E-03	1.03E-03	8.48E-04	7.15E-04	6.13E-04	5.34E-04	4.73E-04	4.22E-04	3.81E-04	3.47E-04	3.18E-04	2.93E-04
35	SF-ann-1000-bus-500d	1.07E-01	9.49E-02	8.50E-02	7.65E-02	6.93E-02	6.31E-02	2.98E-02	1.74E-02	1.15E-02	8.22E-03	6.19E-03	4.86E-03	3.93E-03	3.26E-03	2.76E-03	2.37E-03	2.07E-03	1.83E-03	1.63E-03	1.47E-03	1.34E-03	1.23E-03
	SF-ann-1000-bus-500u	3.42E-02	3.09E-02	2.81E-02	2.57E-02	2.36E-02	2.17E-02	1.11E-02	6.79E-03	4.62E-03	3.37E-03	2.59E-03	2.07E-03	1.70E-03	1.43E-03	1.23E-03	1.07E-03	9.45E-04	8.45E-04	7.63E-04	6.94E-04	6.37E-04	5.87E-04
36	SF-ann-50-bus-1500d	4.43E-03	3.98E-03	3.60E-03	3.26E-03	2.98E-03	2.73E-03	1.33E-03	7.94E-04	5.30E-04	3.81E-04	2.88E-04	2.27E-04	1.84E-04	1.53E-04	1.30E-04	1.12E-04	9.77E-05	8.64E-05	7.73E-05	6.97E-05	6.34E-05	5.80E-05
	SF-ann-50-bus-1500u	1.06E-03	9.86E-04	9.22E-04	8.63E-04	8.09E-04	7.59E-04	4.36E-04	2.82E-04	1.98E-04	1.48E-04	1.15E-04	9.28E-05	7.69E-05	6.52E-05	5.63E-05	4.93E-05	4.37E-05	3.92E-05	3.55E-05	3.23E-05	2.97E-05	2.74E-05
37	SF-ann-100-bus-1500d	8.86E-03	7.96E-03	7.19E-03	6.53E-03	5.95E-03	5.45E-03	2.67E-03	1.59E-03	1.06E-03	7.61E-04	5.76E-04	4.54E-04	3.68E-04	3.06E-04	2.59E-04	2.24E-04	1.95E-04	1.73E-04	1.55E-04	1.39E-04	1.27E-04	1.16E-04
	SF-ann-100-bus-1500u	2.11E-03	1.97E-03	1.84E-03	1.73E-03	1.62E-03	1.52E-03	8.72E-04	5.64E-04	3.96E-04	2.95E-04	2.30E-04	1.86E-04	1.54E-04	1.30E-04	1.13E-04	9.86E-05	8.74E-05	7.83E-05	7.10E-05	6.46E-05	5.94E-05	5.48E-05
38	SF-ann-200-bus-1500d	1.77E-02	1.59E-02	1.44E-02	1.31E-02	1.19E-02	1.09E-02	5.33E-03	3.18E-03	2.12E-03	1.52E-03	1.15E-03	9.07E-04	7.36E-04	6.12E-04	5.19E-04	4.47E-04	3.91E-04	3.46E-04	3.09E-04	2.79E-04	2.53E-04	2.32E-04
	SF-ann-200-bus-1500u	4.22E-03	3.94E-03	3.69E-03	3.45E-03	3.24E-03	3.04E-03	1.74E-03	1.13E-03	7.93E-04	5.91E-04	4.60E-04	3.71E-04	3.08E-04	2.61E-04	2.25E-04	1.97E-04	1.75E-04	1.57E-04	1.42E-04	1.29E-04	1.19E-04	1.10E-04
39	SF-ann-500-bus-1500d	4.43E-02	3.98E-02	3.60E-02	3.26E-02	2.98E-02	2.73E-02	1.33E-02	7.94E-03	5.30E-03	3.81E-03	2.88E-03	2.27E-03	1.84E-03	1.53E-03	1.30E-03	1.12E-03	9.77E-04	8.64E-04	7.73E-04	6.97E-04	6.34E-04	5.80E-04
	SF-ann-500-bus-1500u	1.06E-02	9.86E-03	9.22E-03	8.63E-03	8.09E-03	7.59E-03	4.36E-03	2.82E-03	1.98E-03	1.48E-03	1.15E-03	9.28E-04	7.69E-04	6.52E-04	5.63E-04	4.93E-04	4.37E-04	3.92E-04	3.55E-04	3.23E-04	2.97E-04	2.74E-04
40	SF-ann-1000-bus-1500d	8.86E-02	7.96E-02	7.19E-02	6.53E-02	5.95E-02	5.45E-02	2.67E-02	1.59E-02	1.06E-02	7.61E-03	5.76E-03	4.54E-03	3.68E-03	3.06E-03	2.59E-03	2.24E-03	1.95E-03	1.73E-03	1.55E-03	1.39E-03	1.27E-03	1.16E-03
	SF-ann-1000-bus-1500u	2.11E-02	1.97E-02	1.84E-02	1.73E-02	1.62E-02	1.52E-02	8.72E-03	5.64E-03	3.96E-03	2.95E-03	2.30E-03	1.86E-03	1.54E-03	1.30E-03	1.13E-03	9.86E-04	8.74E-04	7.83E-04	7.10E-04	6.46E-04	5.94E-04	5.48E-04

Model Run number	Name	2687	2828	3536	4243	4950	5657	6364	7071
1	SF-1H-all-500	1.988	1.863	1.406	1.122	0.929	0.791	0.686	0.606
2	SF-1H-all-1500	1.780	1.674	1.281	1.031	0.859	0.734	0.640	0.566
3	SF-1H-sum-500	0.141	0.129	0.092	0.071	0.057	0.051	0.047	0.044
4	SF-1H-sum-1500	0.134	0.123	0.088	0.067	0.054	0.049	0.045	0.042
5	SF-1H-bus-500	1.840	1.720	1.284	1.014	0.831	0.699	0.601	0.524
6	SF-1H-bus-1500	1.648	1.546	1.170	0.932	0.768	0.649	0.560	0.490
7	SF-24H-all-500	0.124	0.116	0.087	0.070	0.058	0.050	0.043	0.039
8	SF-24H-all-1500	0.115	0.108	0.082	0.066	0.055	0.047	0.041	0.037
9	SF-24H-sum-500	0.016	0.015	0.012	0.010	0.009	0.008	0.008	0.007
10	SF-24H-sum-1500	0.015	0.014	0.011	0.010	0.009	0.008	0.007	0.007
11	SF-24H-bus-500	0.181	0.170	0.130	0.105	0.088	0.039	0.066	0.058
12	SF-24H-bus-1500	0.166	0.157	0.121	0.098	0.082	0.036	0.062	0.055
13	SF-ann50-all-500d	1.04E-04	9.59E-05	6.82E-05	5.21E-05	4.17E-05	3.46E-05	2.95E-05	2.55E-05
	SF-ann50-all-500u	3.32E-05	3.08E-05	2.23E-05	1.72E-05	1.39E-05	1.15E-05	9.87E-06	8.56E-06
14	SF-ann100-all-500d	2.08E-04	1.92E-04	1.36E-04	1.04E-04	8.34E-05	6.93E-05	5.89E-05	5.10E-05
	SF-ann100-all-500u	6.64E-05	6.15E-05	4.45E-05	3.44E-05	2.77E-05	2.31E-05	1.97E-05	1.71E-05
15	SF-ann200-all-500d	4.16E-04	3.84E-04	2.73E-04	2.08E-04	1.67E-04	1.39E-04	1.18E-04	1.02E-04
	SF-ann200-all-500u	1.33E-04	1.23E-04	8.90E-05	6.87E-05	5.55E-05	4.61E-05	3.95E-05	3.42E-05
16	SF-ann500-all-500d	1.04E-03	9.59E-04	6.82E-04	5.21E-04	4.17E-04	3.46E-04	2.95E-04	2.55E-04
	SF-ann500-all-500u	3.32E-04	3.08E-04	2.23E-04	1.72E-04	1.39E-04	1.15E-04	9.87E-05	8.56E-05
17	SF-ann1000-all-500d	2.08E-03	1.92E-03	1.36E-03	1.04E-03	8.34E-04	6.93E-04	5.89E-04	5.10E-04
	SF-ann1000-all-500u	6.64E-04	6.15E-04	4.45E-04	3.44E-04	2.77E-04	2.31E-04	1.97E-04	1.71E-04
18	SF-ann50-all-1500d	9.67E-05	8.94E-05	6.40E-05	4.90E-05	3.94E-05	3.27E-05	2.79E-05	2.42E-05
	SF-ann50-all-1500u	3.08E-05	2.86E-05	2.08E-05	1.61E-05	1.31E-05	1.09E-05	9.30E-06	8.11E-06
19	SF-ann100-all-1500d	1.93E-04	1.79E-04	1.28E-04	9.81E-05	7.88E-05	6.54E-05	5.57E-05	4.84E-05
	SF-ann100-all-1500u	6.15E-05	5.72E-05	4.16E-05	3.22E-05	2.61E-05	2.18E-05	1.86E-05	1.62E-05
20	SF-ann200-all-1500d	3.87E-04	3.58E-04	2.56E-04	1.96E-04	1.58E-04	1.31E-04	1.11E-04	9.68E-05
	SF-ann200-all-1500u	1.23E-04	1.14E-04	8.31E-05	6.44E-05	5.23E-05	4.36E-05	3.72E-05	3.24E-05
21	SF-ann500-all-1500d	9.67E-04	8.94E-04	6.40E-04	4.90E-04	3.94E-04	3.27E-04	2.79E-04	2.42E-04
	SF-ann5400-all-1500u	3.08E-04	2.86E-04	2.08E-04	1.61E-04	1.31E-04	1.09E-04	9.30E-05	8.11E-05
22	SF-ann1000-all-1500d	1.93E-03	1.79E-03	1.28E-03	9.81E-04	7.88E-04	6.54E-04	5.57E-04	4.84E-04
	SF-ann1000-all-1500u	6.15E-04	5.72E-04	4.16E-04	3.22E-04	2.61E-04	2.18E-04	1.86E-04	1.62E-04
23	SF-ann-50-sum-500d	7.03E-05	6.48E-05	4.68E-05	3.68E-05	3.04E-05	2.60E-05	2.28E-05	2.03E-05
	SF-ann-50-sum-500u	9.13E-07	9.13E-07	6.85E-07	4.57E-07	4.57E-07	2.28E-07	2.28E-07	2.28E-07
24	SF-ann-100-sum-500d	1.41E-04	1.30E-04	9.36E-05	7.35E-05	6.07E-05	5.21E-05	4.57E-05	4.06E-05
	SF-ann-100-sum-500u	1.83E-06	1.83E-06	1.37E-06	9.13E-07	9.13E-07	4.57E-07	4.57E-07	4.57E-07
25	SF-ann-200-sum-500d	2.81E-04	2.59E-04	1.87E-04	1.47E-04	1.21E-04	1.04E-04	9.13E-05	8.13E-05
	SF-ann-200-sum-500u	3.65E-06	3.65E-06	2.74E-06	1.83E-06	1.83E-06	9.13E-07	9.13E-07	9.13E-07
26	SF-ann-500-sum-500d	7.03E-04	6.48E-04	4.68E-04	3.68E-04	3.04E-04	2.60E-04	2.28E-04	2.03E-04
	SF-ann-500-sum-500u	9.13E-06	9.13E-06	6.85E-06	4.57E-06	4.57E-06	2.28E-06	2.28E-06	2.28E-06
27	SF-ann-50-sum-1500d	6.69E-05	6.19E-05	4.47E-05	3.52E-05	2.90E-05	2.49E-05	2.19E-05	1.94E-05
	SF-ann-50-sum-1500u	9.13E-07	9.13E-07	6.85E-07	4.57E-07	4.57E-07	2.28E-07	2.28E-07	2.28E-07
28	SF-ann-100-sum-1500d	1.34E-04	1.24E-04	8.95E-05	7.03E-05	5.80E-05	4.98E-05	4.38E-05	3.88E-05
	SF-ann-100-sum-1500u	1.83E-06	1.83E-06	1.37E-06	9.13E-07	9.13E-07	4.57E-07	4.57E-07	4.57E-07
29	SF-ann-200-sum-1500d	2.68E-04	2.47E-04	1.79E-04	1.41E-04	1.16E-04	9.95E-05	8.77E-05	7.76E-05
	SF-ann-200-sum-1500u	3.65E-06	3.65E-06	2.74E-06	1.83E-06	1.83E-06	9.13E-07	9.13E-07	9.13E-07
30	SF-ann-500-sum-1500d	6.69E-04	6.19E-04	4.47E-04	3.52E-04	2.90E-04	2.49E-04	2.19E-04	1.94E-04
	SF-ann-500-sum-1500u	9.13E-06	9.13E-06	6.85E-06	4.57E-06	4.57E-06	2.28E-06	2.28E-06	2.28E-06
31	SF-ann-50-bus-500d	5.64E-05	5.22E-05	3.79E-05	2.97E-05	2.44E-05	2.08E-05	1.80E-05	1.60E-05
	SF-ann-50-bus-500u	2.72E-05	2.53E-05	1.88E-05	1.50E-05	1.23E-05	1.05E-05	9.13E-06	8.11E-06
32	SF-ann-100-bus-500d	1.13E-04	1.04E-04	7.58E-05	5.94E-05	4.89E-05	4.16E-05	3.61E-05	3.20E-05
	SF-ann-100-bus-500u	5.43E-05	5.07E-05	3.77E-05	2.99E-05	2.47E-05	2.10E-05	1.83E-05	1.62E-05
33	SF-ann-200-bus-500d	2.26E-04	2.09E-04	1.52E-04	1.19E-04	9.77E-05	8.31E-05	7.21E-05	6.39E-05
	SF-ann-200-bus-500u	1.09E-04	1.01E-04	7.53E-05	5.98E-05	4.93E-05	4.20E-05	3.65E-05	3.24E-05
34	SF-ann-500-bus-500d	5.64E-04	5.22E-04	3.79E-04	2.97E-04	2.44E-04	2.08E-04	1.80E-04	1.60E-04
	SF-ann-500-bus-500u	2.72E-04	2.53E-04	1.88E-04	1.50E-04	1.23E-04	1.05E-04	9.13E-05	8.11E-05
35	SF-ann-1000-bus-500d	1.13E-03	1.04E-03	7.58E-04	5.94E-04	4.89E-04	4.16E-04	3.61E-04	3.20E-04
	SF-ann-1000-bus-500u	5.43E-04	5.07E-04	3.77E-04	2.99E-04	2.47E-04	2.10E-04	1.83E-04	1.62E-04
36	SF-ann-50-bus-1500d	5.34E-05	4.95E-05	3.60E-05	2.82E-05	2.32E-05	1.97E-05	1.72E-05	1.53E-05
	SF-ann-50-bus-1500u	2.55E-05	2.37E-05	1.77E-05	1.40E-05	1.16E-05	9.93E-06	8.68E-06	7.65E-06
37	SF-ann-100-bus-1500d	1.07E-04	9.91E-05	7.19E-05	5.64E-05	4.63E-05	3.95E-05	3.45E-05	3.06E-05
	SF-ann-100-bus-1500u	5.09E-05	4.75E-05	3.54E-05	2.81E-05	2.33E-05	1.99E-05	1.74E-05	1.53E-05
38	SF-ann-200-bus-1500d	2.14E-04	1.98E-04	1.44E-04	1.13E-04	9.27E-05	7.90E-05	6.89E-05	6.12E-05
	SF-ann-200-bus-1500u	1.02E-04	9.50E-05	7.08E-05	5.62E-05	4.66E-05	3.97E-05	3.47E-05	3.06E-05
39	SF-ann-500-bus-1500d	5.34E-04	4.95E-04	3.60E-04	2.82E-04	2.32E-04	1.97E-04	1.72E-04	1.53E-04
	SF-ann-500-bus-1500u	2.55E-04	2.37E-04	1.77E-04	1.40E-04	1.16E-04	9.93E-05	8.68E-05	7.65E-05
40	SF-ann-1000-bus-1500d	1.07E-03	9.91E-04	7.19E-04	5.64E-04	4.63E-04	3.95E-04	3.45E-04	3.06E-04
	SF-ann-1000-bus-1500u	5.09E-04	4.75E-04	3.54E-04	2.81E-04	2.33E-04	1.99E-04	1.74E-04	1.53E-04

Table SF2: Acrolein 1-Hour Hazard Index for San Francisco

concentrations in micrograms/m^3 Acrolein MRL 0.19 ug/m3

Model Run number	Name	Engine Size (hp)	Hours of run time per year	Model outputs	Scenario	Max	Distance Downwind (meters)										
							14	28	42	57	71	85	99	113	127	141	156
1	SF-1H-all-500	500	8760	max 1-hour	all	0.11	0.08	0.11	0.10	0.09	0.07	0.07	0.06	0.05	0.05	0.04	0.04
2	SF-1H-all-1500	1500	8760	max 1-hour	all	0.01	0.00	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
3	SF-1H-sum-500	500	732	max 1-hour	summer	0.11	0.07	0.11	0.10	0.09	0.07	0.06	0.05	0.05	0.04	0.04	0.03
4	SF-1H-sum-1500	1500	732	max 1-hour	summer	0.01	0.00	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.00	0.00
5	SF-1H-bus-500	500	4380	max 1-hour	business	0.11	0.08	0.11	0.10	0.09	0.07	0.07	0.06	0.05	0.05	0.04	0.04
6	SF-1H-bus-1500	1500	4380	max 1-hour	business	0.01	0.00	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01

Model Run	Name	184	198	212	226	240	255	269	283	424	566	707	849	990	1131	1273	1414
1	SF-1H-all-500	0.04	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.02	0.02	0.01	0.01	0.01	0.01	0.01
2	SF-1H-all-1500	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3	SF-1H-sum-500	0.02	0.02	0.02	0.02	0.02	0.01	0.01	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4	SF-1H-sum-1500	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5	SF-1H-bus-500	0.04	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.02	0.02	0.01	0.01	0.01	0.01	0.01
6	SF-1H-bus-1500	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Model Run	Name	1697	1838	1980	2121	2263	2404	2546	2687	2828	3536	4243	4950	5657	6364	7071
1	SF-1H-all-500	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2	SF-1H-all-1500	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3	SF-1H-sum-500	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4	SF-1H-sum-1500	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5	SF-1H-bus-500	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
6	SF-1H-bus-1500	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Table SF3: 24-Hour PM Concentrations as Percent of CalEPA 24-Hour Standard for San Francisco

concentrations in micrograms/m^3 PM10 Standard 50 ug/m3

Model Run number	Name	Engine Size (hp)	Hours of run time per year	Model outputs	Scenario	Max	Distance Downwind (meters)										
							14	28	42	57	71	85	99	113	127	141	156
7	SF-24H-all-500	500	8760	24-hour	all	79.36%	22.65%	72.48%	79.36%	68.62%	54.94%	43.61%	34.97%	28.45%	23.50%	19.68%	16.70%
8	SF-24H-all-1500	1500	8760	24-hour	all	24.65%	0.96%	16.23%	24.65%	23.90%	24.25%	21.99%	19.91%	17.75%	15.68%	13.84%	12.23%
9	SF-24H-sum-500	500	732	24-hour	summer	32.62%	8.71%	31.76%	32.62%	25.82%	19.44%	14.80%	11.52%	9.18%	7.46%	6.18%	5.19%
10	SF-24H-sum-1500	1500	732	24-hour	summer	11.03%	0.17%	5.05%	9.98%	11.03%	10.23%	9.27%	8.02%	6.85%	5.84%	5.01%	4.32%
11	SF-24H-bus-500	500	4380	24-hour	business	56.45%	20.07%	54.53%	56.45%	43.86%	32.83%	24.95%	19.41%	15.46%	12.56%	10.43%	8.80%
12	SF-24H-bus-1500	1500	4380	24-hour	business	18.78%	0.96%	13.98%	18.61%	18.78%	18.14%	15.99%	13.67%	11.60%	9.87%	8.44%	7.28%

Model Run	Name	170	184	198	212	226	240	255	269	283	424	566	707	849	990	1131	1273
7	SF-24H-all-500	14.33%	12.42%	10.87%	9.59%	8.52%	7.73%	7.08%	6.50%	5.99%	3.54%	2.36%	1.70%	1.29%	1.01%	0.82%	0.69%
8	SF-24H-all-1500	10.85%	9.67%	8.66%	7.79%	7.03%	6.38%	5.81%	5.31%	4.87%	2.64%	1.87%	1.39%	1.08%	0.87%	0.72%	0.61%
9	SF-24H-sum-500	4.43%	3.82%	3.33%	2.92%	2.59%	2.31%	2.08%	1.88%	1.70%	0.80%	0.47%	0.31%	0.22%	0.17%	0.13%	0.11%
10	SF-24H-sum-1500	3.76%	3.30%	2.91%	2.59%	2.31%	2.08%	1.88%	1.71%	1.56%	0.74%	0.44%	0.29%	0.21%	0.16%	0.13%	0.10%
11	SF-24H-bus-500	7.98%	7.50%	7.08%	6.72%	6.40%	6.11%	5.84%	5.59%	5.36%	3.64%	2.63%	1.99%	1.58%	1.29%	1.08%	0.93%
12	SF-24H-bus-1500	6.33%	5.55%	4.89%	4.35%	3.89%	3.49%	3.16%	2.91%	2.85%	2.30%	1.85%	1.51%	1.25%	1.06%	0.91%	0.80%

Model Run	Name	1414	1556	1697	1838	1980	2121	2263	2404	2546	2687	2828	3536	4243	4950	5657	6364	7071
7	SF-24H-all-500	0.60%	0.52%	0.46%	0.42%	0.38%	0.34%	0.31%	0.29%	0.27%	0.25%	0.23%	0.17%	0.14%	0.12%	0.10%	0.09%	0.08%
8	SF-24H-all-1500	0.53%	0.47%	0.42%	0.38%	0.34%	0.31%	0.29%	0.27%	0.25%	0.23%	0.22%	0.16%	0.13%	0.11%	0.09%	0.08%	0.07%
9	SF-24H-sum-500	0.09%	0.08%	0.07%	0.06%	0.05%	0.05%	0.04%	0.04%	0.02%	0.03%	0.03%	0.02%	0.02%	0.02%	0.02%	0.02%	0.01%
10	SF-24H-sum-1500	0.09%	0.07%	0.06%	0.06%	0.05%	0.04%	0.04%	0.04%	0.02%	0.03%	0.03%	0.02%	0.02%	0.02%	0.02%	0.01%	0.01%
11	SF-24H-bus-500	0.81%	0.72%	0.64%	0.58%	0.53%	0.48%	0.45%	0.42%	0.39%	0.36%	0.34%	0.26%	0.21%	0.18%	0.08%	0.13%	0.12%
12	SF-24H-bus-1500	0.70%	0.63%	0.57%	0.52%	0.48%	0.44%	0.41%	0.38%	0.35%	0.33%	0.31%	0.24%	0.20%	0.16%	0.07%	0.12%	0.11%

Table SF4: Chronic Cancer Risk for San Francisco

concentrations in micrograms/m^3

Model Run number	Name	Engine Size (hp)	Hours of run time per year	Model outputs	Scenario	Wind	Max	Distance Downwind (meters)																														
								14	28	42	57	71	85	99	113	127	141	156	170	184	198	212	226	240	255	269	283	424	566	707	849	990	1131	1273	1414	1556	1697	1838
1	SF-ann50-all-500d	500	50	annual	all	downwind	11.2	1.1	9.3	11.2	9.6	7.6	6.0	4.8	4.0	3.4	2.9	2.5	2.3	2.0	1.8	1.7	1.5	1.4	1.3	1.2	1.1	0.6	0.4	0.3	0.2	0.2	0.1	0.1	0.1	0.1	0.1	0.1
	SF-ann50-all-500u	500	50	annual	all	upwind	1.5	0.0	0.6	1.3	1.5	1.5	1.3	1.1	1.0	0.9	0.8	0.7	0.6	0.6	0.5	0.5	0.4	0.4	0.4	0.3	0.3	0.2	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
14	SF-ann100-all-500d	500	100	annual	all	downwind	22.4	2.2	18.7	22.4	19.2	15.2	12.1	9.7	8.0	6.7	5.8	5.1	4.5	4.1	3.7	3.4	3.1	2.8	2.6	2.4	2.3	1.3	0.8	0.6	0.4	0.3	0.3	0.2	0.2	0.2	0.1	0.1
	SF-ann100-all-500u	500	100	annual	all	upwind	3.1	0.0	1.3	2.6	3.1	2.9	2.6	2.2	1.9	1.7	1.5	1.4	1.2	1.1	1.0	0.9	0.9	0.8	0.7	0.7	0.6	0.4	0.2	0.2	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.0
15	SF-ann200-all-500d	500	200	annual	all	downwind	44.8	4.5	37.4	44.8	38.3	30.5	24.1	19.4	16.0	13.5	11.6	10.2	9.0	8.1	7.3	6.7	6.1	5.7	5.2	4.9	4.5	2.5	1.6	1.1	0.8	0.6	0.5	0.4	0.4	0.3	0.3	0.2
	SF-ann200-all-500u	500	200	annual	all	upwind	6.1	0.1	2.6	5.3	6.1	5.8	5.2	4.5	3.9	3.4	3.0	2.7	2.4	2.2	2.0	1.9	1.7	1.6	1.5	1.4	1.3	0.7	0.5	0.3	0.2	0.2	0.2	0.1	0.1	0.1	0.1	0.1
16	SF-ann500-all-500d	500	500	annual	all	downwind	112.0	11.2	93.4	112.0	95.8	76.2	60.3	48.5	39.9	33.7	29.0	25.4	22.6	20.3	18.4	16.8	15.4	14.2	13.1	12.2	11.4	6.3	4.0	2.8	2.1	1.6	1.3	1.0	0.9	0.8	0.7	0.6
	SF-ann500-all-500u	500	500	annual	all	upwind	15.3	0.2	6.5	13.2	15.3	14.5	12.9	11.2	9.7	8.6	7.6	6.8	6.1	5.5	5.0	4.6	4.3	4.0	3.7	3.4	3.2	1.8	1.2	0.8	0.6	0.5	0.4	0.3	0.3	0.2	0.2	0.2
17	SF-ann1000-all-500d	500	1000	annual	all	downwind	224.1	22.4	186.8	224.1	191.7	152.4	120.6	97.0	79.8	67.3	58.0	50.8	45.1	40.5	36.7	33.5	30.7	28.3	26.2	24.4	22.7	12.6	8.0	5.6	4.1	3.2	2.6	2.1	1.8	1.5	1.3	1.1
	SF-ann1000-all-500u	500	1000	annual	all	upwind	30.6	0.4	13.0	26.5	30.6	29.0	25.8	22.4	19.5	17.1	15.1	13.5	12.2	11.1	10.1	9.3	8.5	7.9	7.3	6.8	6.4	3.6	2.4	1.7	1.2	1.0	0.8	0.6	0.5	0.5	0.4	0.4
18	SF-ann50-all-1500d	1500	50	annual	all	downwind	3.2	0.0	0.6	2.0	3.0	3.2	3.1	2.8	2.5	2.2	1.9	1.7	1.6	1.4	1.3	1.2	1.1	1.0	0.9	0.9	0.8	0.5	0.3	0.2	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1
	SF-ann50-all-1500u	1500	50	annual	all	upwind	0.4	0.0	0.0	0.1	0.2	0.3	0.3	0.4	0.4	0.4	0.4	0.3	0.3	0.3	0.3	0.3	0.3	0.2	0.2	0.2	0.2	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
19	SF-ann100-all-1500d	1500	100	annual	all	downwind	6.5	0.0	1.2	4.1	6.0	6.5	6.2	5.6	5.0	4.4	3.9	3.5	3.1	2.8	2.6	2.4	2.2	2.0	1.9	1.8	1.7	1.0	0.7	0.5	0.4	0.3	0.2	0.2	0.2	0.1	0.1	0.1
	SF-ann100-all-1500u	1500	100	annual	all	upwind	0.8	0.0	0.0	0.2	0.4	0.6	0.7	0.7	0.8	0.7	0.7	0.7	0.7	0.6	0.6	0.5	0.5	0.5	0.5	0.4	0.4	0.3	0.2	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0
20	SF-ann200-all-1500d	1500	200	annual	all	downwind	12.9	0.0	2.4	8.2	12.0	12.9	12.3	11.2	9.9	8.8	7.8	6.9	6.2	5.7	5.2	4.7	4.4	4.1	3.8	3.5	3.3	2.0	1.3	0.9	0.7	0.6	0.5	0.4	0.3	0.3	0.2	0.2
	SF-ann200-all-1500u	1500	200	annual	all	upwind	1.5	0.0	0.0	0.3	0.7	1.1	1.4	1.5	1.5	1.5	1.4	1.4	1.3	1.2	1.2	1.1	1.0	1.0	0.9	0.9	0.8	0.5	0.4	0.3	0.2	0.2	0.1	0.1	0.1	0.1	0.1	0.1
21	SF-ann500-all-1500d	1500	500	annual	all	downwind	32.4	0.1	6.0	20.5	30.0	32.4	30.8	27.9	24.8	22.0	19.5	17.4	15.6	14.1	12.9	11.8	10.9	10.1	9.4	8.8	8.3	4.9	3.3	2.4	1.8	1.4	1.1	0.9	0.8	0.7	0.6	0.5
	SF-ann5400-all-1500u	1500	500	annual	all	upwind	3.8	0.0	0.1	0.8	1.9	2.8	3.4	3.7	3.8	3.7	3.6	3.4	3.3	3.1	2.9	2.7	2.6	2.4	2.3	2.2	2.1	1.3	0.9	0.7	0.5	0.4	0.3	0.3	0.2	0.2	0.2	0.2
22	SF-ann1000-all-1500d	1500	1000	annual	all	downwind	64.7	0.1	12.1	40.9	60.1	64.7	61.7	55.9	49.7	43.9	38.9	34.7	31.2	28.3	25.8	23.7	21.9	20.3	18.9	17.7	16.6	9.8	6.6	4.7	3.6	2.8	2.3	1.9	1.6	1.4	1.2	1.1
	SF-ann1000-all-1500u	1500	1000	annual	all	upwind	7.6	0.0	0.2	1.5	3.7	5.7	6.9	7.4	7.6	7.5	7.2	6.9	6.5	6.1	5.8	5.5	5.2	4.9	4.6	4.4	4.2	2.7	1.8	1.4	1.0	0.8	0.7	0.6	0.5	0.4	0.4	0.3
23	SF-ann-50-sum-500d	500	50	annual	summer	downwind	31.3	5.6	31.3	29.8	22.4	16.5	12.4	9.5	7.5	6.1	5.0	4.2	3.6	3.1	2.7	2.3	2.1	1.8	1.7	1.5	1.3	0.6	0.4	0.2	0.2	0.1	0.1	0.1	0.1	0.1	0.0	0.0
	SF-ann-50-sum-500u	500	50	annual	summer	upwind	0.2	0.0	0.1	0.2	0.2	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
24	SF-ann-100-sum-500d	500	100	annual	summer	downwind	62.7	11.2	62.7	59.6	44.8	32.9	24.7	19.1	15.1	12.2	10.1	8.4	7.2	6.1	5.3	4.7	4.1	3.7	3.3	3.0	2.7	1.2	0.7	0.5	0.3	0.2	0.2	0.2	0.1	0.1	0.1	0.1
	SF-ann-100-sum-500u	500	100	annual	summer	upwind	0.4	0.0	0.3	0.4	0.4	0.3	0.3	0.2	0.2	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
25	SF-ann-200-sum-500d	500	200	annual	summer	downwind	125.3	22.3	125.3	119.3	89.5	65.8	49.4	38.1	30.2	24.4	20.1	16.8	14.3	12.3	10.7	9.4	8.3	7.4	6.6	6.0	5.4	2.5	1.4	0.9	0.7	0.5	0.4	0.3	0.3	0.2	0.2	0.2
	SF-ann-200-sum-500u	500	200	annual	summer	upwind	0.8	0.0	0.5	0.8	0.8	0.7	0.5	0.4	0.4	0.3	0.3	0.2	0.2	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
26	SF-ann-500-sum-500d	500	500	annual	summer	downwind	313.3	55.8	313.3	298.2	223.8	164.5	123.5	95.3	75.4	61.0	50.3	42.1	35.8	30.7	26.7	23.4	20.7	18.4	16.5	14.9	13.5	6.2	3.6	2.3	1.6	1.2	1.0	0.8	0.6	0.5	0.5	0.4
	SF-ann-500-sum-500u	500	500	annual	summer	upwind	2.0	0.1	1.3	2.0	2.0	1.7	1.4	1.1	0.9	0.8	0.6	0.5	0.5	0.4	0.4	0.3	0.3	0.2	0.2	0.2	0.2	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
27	SF-ann-50-sum-1500d	1500	50	annual	summer	downwind	10.3	0.0	3.2	8.6	10.3	9.6	8.3	7.0	5.9	4.9	4.2	3.6	3.1	2.7	2.4	2.1	1.9	1.7	1.5	1.4	1.2	0.6	0.3	0.2	0.2	0.1	0.1	0.1	0.1	0.1	0.0	0.0
	SF-ann-50-sum-1500u	1500	50	annual	summer	upwind	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
28	SF-ann-100-sum-1500d	1500	100	annual	summer	downwind	20.6	0.1	6.4	17.2	20.6	19.3	16.6	14.0	11.7	9.9	8.4	7.2	6.2	5.4	4.7	4.2	3.7	3.3	3.0	2.7	2.5	1.2	0.7	0.4	0.3	0.2	0.2	0.1	0.1	0.1	0.1	0.1
	SF-ann-100-sum-1500u	1500	100	annual	summer	upwind	0.1	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
29	SF-ann-200-sum-1500d	1500	200	annual	summer	downwind	41.3	0.1	12.7	34.4	41.3	38.6	33.2	27.9	23.4	19.7	16.7	14.3	12.4	10.8	9.5	8.4	7.5	6.7	6.0	5.5	5.0	2.3	1.3	0.9	0.6	0.5	0.4	0.3	0.2	0.2	0.2	0.2
	SF-ann-200-sum-1500u	1500	200	annual	summer	upwind	0.2	0.0	0.0	0.0	0.1	0.2	0.2	0.2	0.2	0.2	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
30	SF-ann-500-sum-1500d	1500	500	annual	summer	downwind	103.2	0.3	31.8	85.9	103.2	96.4	83.1	69.8	58.5	49.3	41.8	35.8	30.9	27.0	23.7	21.0	18.7	16.7	15.1	13.6	12.4	5.8	3.4	2.2	1.6	1.2	0.9	0.7	0.6	0.5	0.4	0.4
	SF-ann-500-sum-1500u	1500	500	annual	summer	upwind	0.5	0.0	0.0	0.1	0.3	0.4	0.5	0.5	0.5	0.4	0.4	0.4	0.3	0.3	0.3	0.2	0.2	0.2	0.2	0.2	0.2	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
31	SF-ann-50-bus-500d	500	50	annual	business	downwind	15.8	2.1	14.6	15.8	12.8	9.9	7.6	6.0	4.8	4.0	3.3	2.8	2.4	2.1	1.8	1.6	1.4	1.3	1.1	1.0	0.9	0.4	0.3	0.2	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0
	SF-ann-50-bus-500u	500	50	annual	business	upwind	1.9	0.0	0.8	1.6	1.9	1.8	1.6	1.4	1.2	1.1	0.9	0.8	0.7	0.6	0.6	0.5	0.5	0.4	0.4	0.4	0.3	0.2	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
32	SF-ann-100-bus-500d	500	100	annual	business	downwind	31.6	4.2	29.2	31.6	25.6	19.7	15.3	12.0	9.7	7.9	6.6	5.6	4.8	4.1	3.6	3.2	2.8	2.5	2.3	2.1	1.9	0.9	0.5	0.3	0.2	0.2	0.1	0.1	0.1	0.1	0.1	0.1
	SF-ann-100-bus-500u	500	100	annual	business	upwind	3.8	0.0	1.5	3.2	3.8	3.6	3.3	2.8	2.4	2.1	1.8	1.6	1.4	1.3	1.1	1.0	0.9	0.8	0.8	0.7	0.7	0.3	0.2	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0
33	SF-ann-200-bus-500d	500	200	annual	business	downwind	63.3	8.5	58.4	63.3	51.2	39.4	30.5	24.0	19.3	15.8	13.2	11.2	9.6	8.3	7.3	6.4	5.7	5.1	4.6	4.2	3.8	1.8	1.0	0.7	0.5	0.4	0.3	0.2	0.2	0.2	0.1	0.1
	SF-ann-200-bus-500u	500	200	annual	business	upwind	7.5	0.1	3.1	6.4	7.5	7.3	6.5	5.7	4.9	4.2	3.7	3.2	2.9	2.5	2.3	2.1	1.9	1.7	1.5	1.4	1.3	0.7	0.4	0.3	0.2	0.2	0.1	0.1	0.1	0.1	0.1	0.1
34	SF-ann-500-bus-500d	500	500	annual	business	downwind	158.2	21.2	146.1	158.2	128.1	98.6	76.3	60.1	48.3	39.6	33.0	27.9	23.9	20.7	18.1	16.0	14.2	12.7	11.5	10.4	9.5	4.5	2.6	1.7	1.2	0.9	0.7	0.6	0.5	0.4	0.4	0.3
	SF-ann-500-bus-500u	500	500	annual	business	upwind	18.9	0.2	7.7	15.9	18.9	18.2	16.3	14.2	12.2	10.6	9.2	8.1	7.2	6.4	5.7	5.1	4.6	4.2	3.9	3.5	3.3	1.7	1.0	0.7	0.5	0.4	0.3	0.3	0.2	0.2	0.2	0.1
35	SF-ann-1000-bus-500d	500	1000	annual	business	downwind	316.5	42.4	292.2	316.5	256.2	197.2	152.6	120.2	96.7	79.2	66.0	55.9	47.9	41.5	36.3	32.0	28.5	25.5	23.0	20.8	18.9	8.9	5.2	3.5	2.5	1.9	1.5	1.2	1.0	0.8	0.7	0.6
	SF-ann-1000-bus-500u	500	1000	annual	business	upwind	37.7	0.4	15.3	31.9	37.7	36.4	32.6	28.3	24.5	21.2	18.5	16.2	14.3	12.7	11.4	10.3	9.3	8.4	7.7	7.1	6.5	3.3	2.0	1.4	1.0	0.8	0.6	0.5	0.4	0.4	0.3	0.3
36	SF-ann-50-bus-1500d	1500	50	annual	business	downwind	4.8	0.0	1.1	3.5	4.7	4.8	4.3	3.8	3.3	2.9	2.5	2.2	1.9	1.7	1.5	1.3	1.2	1.1	1.0	0.9	0.8	0.4	0.2	0.2	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0
	SF-ann-50-bus-1500u	1500	50	annual	business	upwind	0.5	0.0	0.0	0.1	0.2	0.3	0.4	0.4	0.5	0.4	0.4	0.4	0.4	0.4	0.3	0.3	0.3	0.3	0.3	0.2	0.2	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
37	SF-ann-100-bus-1500d	1500	100	annual	business	downwind	9.5	0.0	2.3	7.0	9.4	9.5	8.7	7.6	6.6	5.7	5.0	4.3	3.8	3.3	3.0	2.7	2.4	2.2	2.0	1.8	1.6	0.8	0.5	0.3	0.2	0.2	0.1	0.1	0.1	0.1	0.1	0.1
	SF-ann-100-bus-1500u	1500	100	annual	business	upwind	0.9	0.0	0.0	0.2	0.4	0.6	0.8	0.9	0.9	0.9	0.9	0.8	0.8	0.7	0.7	0.6	0.6	0.6	0.5	0.5	0.5	0.3	0.2	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0
38	SF-ann-200-bus-1500d	1500	200	annual	business	downwind	19.0	0.0	4.5	13.9	18.7	19.0	17.4	15.3	13.2	11.4	9.9	8.6	7.6	6.7	5.9	5.3	4.8	4.3	3.9	3.6	3.3	1.6	1.0	0.6	0.5	0.3	0.3	0.2	0.2	0.2	0.1	0.1
	SF-ann-200-bus-1500u	1500	200	annual	business	upwind	1.8	0.0	0.0	0.3	0.8	1.3	1.6	1.8	1.8	1.8	1.7	1.6	1.5	1.4	1.4	1.3	1.2	1.1	1.0	1.0	0.9	0.5	0.3	0.2	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1
39	SF-ann-500-bus-1500d	1500	500	annual	business	downwind	47.5	0.1	11.4	34.8	46.8	47.5	43.5	38.2	33.1	28.6	24.8	21.6	18.9	16.7	14.9	13.3	11.9	10.8	9.8	8.9	8.2	4.0	2.4	1.6	1.1	0.9	0.7	0.6	0.5	0.4	0.3	0.3
	SF-ann-500-bus-1500u	1500	500	annual	business	upwind	4.5	0.0	0.1	0.8	2.1	3.2	4.0	4.4	4.5	4.5	4.3	4.1	3.9	3.6	3.4	3.2	3.0	2.8	2.6	2.4	2.3	1.3	0.8	0.6	0.4	0.3	0.3	0.2	0.2	0.2	0.1	0.1
40	SF-ann-1000-bus-1500d	1500	1000	annual	business	downwind	95.1	0.2	22.7	69.5	93.7	95.1	86.9	76.3	66.1	57.1	49.5	43.2	37.9	33.5	29.7	26.6	23.9	21.6	19.6	17.9	16.4	8.0	4.8	3.2	2.3	1.7	1.4	1.1	0.9	0.8	0.7	0.6
	SF-ann-1000-bus-1500u	1500	1000	annual	business	upwind	9.0	0.0	0.2	1.6	4.1	6.5	8.0	8.8	9.0	9.0	8.6	8.2	7.7	7.2	6.8	6.3	5.9	5.5	5.2	4.9	4.6	2.6	1.7	1.2	0.9	0.7	0.6	0.5	0.4	0.3	0.3	0.3

Model Run number	**Name**	1980	2121	2263	2404	2546	2687	2828	3536	4243	4950	5657	6364	7071
1	SF-ann50-all-500d	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	SF-ann50-all-500u	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
14	SF-ann100-all-500d	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0
	SF-ann100-all-500u	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
15	SF-ann200-all-500d	0.2	0.2	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.0
	SF-ann200-all-500u	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
16	SF-ann500-all-500d	0.5	0.5	0.4	0.4	0.3	0.3	0.3	0.2	0.2	0.1	0.1	0.1	0.1
	SF-ann500-all-500u	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0
17	SF-ann1000-all-500d	1.0	0.9	0.8	0.7	0.7	0.6	0.6	0.4	0.3	0.3	0.2	0.2	0.2
	SF-ann1000-all-500u	0.3	0.3	0.3	0.2	0.2	0.2	0.2	0.1	0.1	0.1	0.1	0.1	0.1
18	SF-ann50-all-1500d	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	SF-ann50-all-1500u	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
19	SF-ann100-all-1500d	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0
	SF-ann100-all-1500u	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
20	SF-ann200-all-1500d	0.2	0.2	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0
	SF-ann200-all-1500u	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
21	SF-ann500-all-1500d	0.5	0.4	0.4	0.3	0.3	0.3	0.3	0.2	0.1	0.1	0.1	0.1	0.1
	SF-ann5400-all-1500u	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0
22	SF-ann1000-all-1500d	0.9	0.8	0.8	0.7	0.6	0.6	0.5	0.4	0.3	0.2	0.2	0.2	0.1
	SF-ann1000-all-1500u	0.3	0.3	0.2	0.2	0.2	0.2	0.2	0.1	0.1	0.1	0.1	0.1	0.0
23	SF-ann-50-sum-500d	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	SF-ann-50-sum-500u	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
24	SF-ann-100-sum-500d	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	SF-ann-100-sum-500u	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
25	SF-ann-200-sum-500d	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0
	SF-ann-200-sum-500u	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
26	SF-ann-500-sum-500d	0.3	0.3	0.3	0.3	0.2	0.2	0.2	0.1	0.1	0.1	0.1	0.1	0.1
	SF-ann-500-sum-500u	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
27	SF-ann-50-sum-1500d	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	SF-ann-50-sum-1500u	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
28	SF-ann-100-sum-1500d	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	SF-ann-100-sum-1500u	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
29	SF-ann-200-sum-1500d	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0
	SF-ann-200-sum-1500u	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
30	SF-ann-500-sum-1500d	0.3	0.3	0.3	0.2	0.2	0.2	0.2	0.1	0.1	0.1	0.1	0.1	0.1
	SF-ann-500-sum-1500u	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
31	SF-ann-50-bus-500d	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	SF-ann-50-bus-500u	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
32	SF-ann-100-bus-500d	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	SF-ann-100-bus-500u	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
33	SF-ann-200-bus-500d	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0
	SF-ann-200-bus-500u	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
34	SF-ann-500-bus-500d	0.3	0.2	0.2	0.2	0.2	0.2	0.2	0.1	0.1	0.1	0.1	0.1	0.0
	SF-ann-500-bus-500u	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0
35	SF-ann-1000-bus-500d	0.5	0.5	0.4	0.4	0.4	0.3	0.3	0.2	0.2	0.1	0.1	0.1	0.1
	SF-ann-1000-bus-500u	0.3	0.2	0.2	0.2	0.2	0.2	0.2	0.1	0.1	0.1	0.1	0.1	0.0
36	SF-ann-50-bus-1500d	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	SF-ann-50-bus-1500u	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
37	SF-ann-100-bus-1500d	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	SF-ann-100-bus-1500u	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
38	SF-ann-200-bus-1500d	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0
	SF-ann-200-bus-1500u	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
39	SF-ann-500-bus-1500d	0.3	0.2	0.2	0.2	0.2	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.0
	SF-ann-500-bus-1500u	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0
40	SF-ann-1000-bus-1500d	0.5	0.5	0.4	0.4	0.3	0.3	0.3	0.2	0.2	0.1	0.1	0.1	0.1
	SF-ann-1000-bus-1500u	0.2	0.2	0.2	0.2	0.2	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.0

Table 2-5: ISC Model Results: Maximum Long-term Average Concentration at Five Cities

			Model Specifications per Year of Meteorological Data							Annual Average Concentration, Based on Hours Running Per Year			
			Number of Days	Number of Hours	Number of Hours with BUG On	Number of Hours with BUG Off	Average Concentration Over Modeling Period	Average Concentration when the BUG is On	Comparison with "All" Scenario	50	100	500	1000
Fresno	500 hp	all	365	8760	8760	0	7.93	7.93	-	0.05	0.09	0.45	0.91
Fresno	500 hp	summer	122	2928	732	2196	5.4	21.60	2.7	0.12	0.25	1.23	2.47
Fresno	500 hp	business	365	8760	4380	4380	5.57	11.14	1.4	0.06	0.13	0.64	1.27
Fresno	1500 hp	all	365	8760	8760	0	2.07	2.07	-	0.01	0.02	0.12	0.24
Fresno	1500 hp	summer	122	2928	732	2196	1.41	5.64	2.7	0.03	0.06	0.32	0.64
Fresno	1500 hp	business	365	8760	4380	4380	1.4	2.80	1.4	0.02	0.03	0.16	0.32
San Diego	500 hp	all	365	8760	8760	0	7.82	7.82	-	0.04	0.09	0.45	0.89
San Diego	500 hp	summer	122	2928	732	2196	5.14	20.56	2.6	0.12	0.23	1.17	2.35
San Diego	500 hp	business	365	8760	4380	4380	6.94	13.88	1.8	0.08	0.16	0.79	1.58
San Diego	1500 hp	all	365	8760	8760	0	2.1	2.10	-	0.01	0.02	0.12	0.24
San Diego	1500 hp	summer	122	2928	732	2196	1.41	5.64	2.7	0.03	0.06	0.32	0.64
San Diego	1500 hp	business	365	8760	4380	4380	1.88	3.76	1.8	0.02	0.04	0.21	0.43
San Francisco	500 hp	all	365	8760	8760	0	10.3	10.30	-	0.06	0.12	0.59	1.18
San Francisco	500 hp	summer	122	2928	732	2196	6.66	26.64	2.6	0.15	0.30	1.52	3.04
San Francisco	500 hp	business	365	8760	4380	4380	5.92	11.84	1.1	0.07	0.14	0.68	1.35
San Francisco	1500 hp	all	365	8760	8760	0	2.99	2.99	-	0.02	0.03	0.17	0.34
San Francisco	1500 hp	summer	122	2928	732	2196	2.05	8.20	2.7	0.05	0.09	0.47	0.94
San Francisco	1500 hp	business	365	8760	4380	4380	1.87	3.74	1.3	0.02	0.04	0.21	0.43
Los Angeles	500 hp	all	365	8760	8760	0	12.73	12.73	-	0.07	0.15	0.73	1.45
Los Angeles	500 hp	summer	122	2928	732	2196	10.02	40.08	3.1	0.23	0.46	2.29	4.58
Los Angeles	500 hp	business	365	8760	4380	4380	11.63	23.26	1.8	0.13	0.27	1.33	2.66
Los Angeles	1500 hp	all	365	8760	8760	0	3.4	3.40	-	0.02	0.04	0.19	0.39
Los Angeles	1500 hp	summer	122	2928	732	2196	2.82	11.28	3.3	0.06	0.13	0.64	1.29
Los Angeles	1500 hp	business	365	8760	4380	4380	3.12	6.24	1.8	0.04	0.07	0.36	0.71
Sacramento	500 hp	all	365	8760	8760	0	6.44	6.44	-	0.04	0.07	0.37	0.74
Sacramento	500 hp	summer	122	2928	732	2196	5.27	21.08	3.3	0.12	0.24	1.20	2.41
Sacramento	500 hp	business	365	8760	4380	4380	5.23	10.46	1.6	0.06	0.12	0.60	1.19
Sacramento	1500 hp	all	365	8760	8760	0	1.74	1.74	-	0.01	0.02	0.10	0.20
Sacramento	1500 hp	summer	122	2928	732	2196	1.44	5.76	3.3	0.03	0.07	0.33	0.66
Sacramento	1500 hp	business	365	8760	4380	4380	1.41	2.82	1.6	0.02	0.03	0.16	0.32

Each city was run using all available years of meteorological data.

The column labeled 'Comparison with "All" Scenario' is a ratio of the concentration for the summer or business scenario with the analogous All Scenario. This comparison indicates how the summer and business subsections of the meteorology differ from the entire dataset.

Values in this chart are the average annual average over five years of meteorological data, taken at the worst-case location. This is often refered to as the concentration at the location of the MEI (Maximally Exposed Individual). These values may not directly correspond to the values in table 2-5 as those values correspond only to the upwind and downwind vector directions. The values presented here may be from a point not included in our analysis.

Table 2-6 Chronic Risk Zone

FRESNO

500 hp

Hours of run time per year	Scenario	Interpolated Distance Downwind from BUG to risk of						Interpolated Distance Upwind from BUG to risk of					
		100 per million	50 per million	10 per million	5 per million	1 per million	0.5 per million	100 per million	50 per million	10 per million	5 per million	1 per million	0.5 per million
50	all			79	151	607	947						
50	business			102	163	441	662						
50	summer			58	104	260	391						
100	all			151	309	947	1462						387
100	business			163	252	662	973					120	206
100	summer			104	158	391	468						
200	all		59	309	525	1462	2271					387	680
200	business		85	252	396	973	1459						348
200	summer			158	231	545	776						92
500	all	143	151	607	947	2628	4178					796	1258
500	business	102	163	441	662	1670	2616				120	396	599
500	summer	134	197	474	670	1566	2433				57	221	345
1000	all	151	309	947	1462	4178	6735				387	1258	1976
1000	business	163	252	662	973	2616	4316			120	206	599	906

1500 hp

Hours of run time per year	Scenario	Interpolated Distance Downwind from BUG to risk of						Interpolated Distance Upwind from BUG to risk of					
		100 per million	50 per million	10 per million	5 per million	1 per million	0.5 per million	100 per million	50 per million	10 per million	5 per million	1 per million	0.5 per million
50	all					499	842						
50	business					396	602						
50	summer					234	369						
100	all				171	842	1356						
100	business				200	602	913						
100	summer				114	369	524						
200	all			171	404	1356	2145						498
200	business			200	346	913	1380						233
200	summer			114	203	524	745						
500	all			499	842	2491	4014					638	1120
500	business			396	602	1584	2495					291	511
500	summer		165	443	645	1518	2350					158	281
1000	all		171	842	1356	4014	6450					1120	1830
1000	business		200	602	913	2495	4136					511	810

Table 2-6 Chronic Risk Zone

LOS ANGELES

500 hp

Hours of run time per year	**Scenario**	Interpolated Distance Downwind from BUG to risk of						Interpolated Distance Upwind from BUG to risk of					
		100 per million	50 per million	10 per million	5 per million	1 per million	0.5 per million	100 per million	50 per million	10 per million	5 per million	1 per million	0.5 per million
50	all				60	263	439						219
50	business				99	269	408					91	162
50	summer			49	93	227	342						
100	all			60	124	439	685					219	458
100	business			99	155	408	589					162	254
100	summer			93	139	342	468						
200	all			124	220	685	1040					458	751
200	business			155	236	589	851					254	397
200	summer			139	202	468	652						
500	all		60	277	439	1188	1940				219	867	1361
500	business		99	269	408	965	1406			106	162	442	661
500	summer	49	93	227	342	716	998						
1000	all	60	124	439	685	1799	2759			219	458	1361	2127
1000	business	99	155	408	589	1406	2099			162	254	661	980

1500 hp

Hours of run time per year	**Scenario**	Interpolated Distance Downwind from BUG to risk of						Interpolated Distance Upwind from BUG to risk of					
		100 per million	50 per million	10 per million	5 per million	1 per million	0.5 per million	100 per million	50 per million	10 per million	5 per million	1 per million	0.5 per million
50	all					166	349						
50	business					226	372						0
50	summer					206	316						
100	all					349	592						
100	business					372	545						169
100	summer				103	316	443						
200	all				119	592	948						618
200	business				193	545	806					169	332
200	summer			166	268	443	631						
500	all			166	349	1093	1688					744	1241
500	business			226	372	912	1342					388	598
500	summer			206	316	686	973					0	0
1000	all			349	592	1688	2621					1241	1996
1000	business			372	545	1342	2004				169	598	920

Table 2-6 Chronic Risk Zone

SACRAMENTO

500 hp

Hours of run time per year	**Scenario**	Interpolated Distance Downwind from BUG to risk of						Interpolated Distance Upwind from BUG to risk of					
		100 per million	50 per million	10 per million	5 per million	1 per million	0.5 per million	100 per million	50 per million	10 per million	5 per million	1 per million	0.5 per million
50	all				97	317	497						
50	business			84	133	350	495						92
50	summer			119	175	413	582						
100	all			97	159	497	749						126
100	business			133	199	495	700					92	172
100	summer		64	175	253	582	830						
200	all			159	262	749	1128					126	266
200	business		69	199	299	700	1019					172	275
200	summer	64	104	253	381	830	1191						121
500	all		97	317	497	1292	2119					334	548
500	business	84	133	350	495	1151	1720				92	331	496
500	summer	119	175	413	582	1343	1996					142	218
1000	all	97	159	497	749	1982	3164				126	548	857
1000	business	133	199	495	700	1720	2690			92	172	496	728

1500 hp

Hours of run time per year	**Scenario**	Interpolated Distance Downwind from BUG to risk of						Interpolated Distance Upwind from BUG to risk of					
		100 per million	50 per million	10 per million	5 per million	1 per million	0.5 per million	100 per million	50 per million	10 per million	5 per million	1 per million	0.5 per million
50	all					240	416						
50	business					309	458						
50	summer				150	401	561						
100	all				91	416	675						
100	business				164	458	671						
100	summer			150	233	561	809						
200	all			91	200	675	1052						
200	business			164	262	671	976						163
200	summer			233	363	809	1156						
500	all			240	416	1211	1881						410
500	business			309	458	1106	1657					223	411
500	summer				150	401	561		150	401	561	1304	1940
1000	all		91	416	675	1881	3009					404	748
1000	business		164	458	671	1646	2590					411	660

Table 2-6 Chronic Risk Zone

SAN DIEGO

500 hp

Hours of run time per year	Scenario	Interpolated Distance Downwind from BUG to risk of						Interpolated Distance Upwind from BUG to risk of					
		100 per million	50 per million	10 per million	5 per million	1 per million	0.5 per million	100 per million	50 per million	10 per million	5 per million	1 per million	0.5 per million
50	all			58	122	451	705						0
50	business			96	154	423	645						116
50	summer				79	211	321						
100	all			122	220	705	1092					161	331
100	business			154	239	645	957					116	194
100	summer			79	125	321	454						
200	all			220	391	1092	1679					331	548
200	business		81	239	384	957	1440					194	315
200	summer			125	186	454	655						
500	all	58	122	451	705	1935	3077				161	641	989
500	business	96	154	423	645	1640	2579				116	367	538
500	summer	105	158	397	556	1307	1920						
1000	all	122	220	705	1092	3077	4880			161	331	989	1531
1000	business	154	239	504	957	2579	4218			116	194	538	801

1500 hp

Hours of run time per year	Scenario	Interpolated Distance Downwind from BUG to risk of						Interpolated Distance Upwind from BUG to risk of					
		100 per million	50 per million	10 per million	5 per million	1 per million	0.5 per million	100 per million	50 per million	10 per million	5 per million	1 per million	0.5 per million
50	all					353	615						
50	business					383	581						
50	summer					183	283						
100	all				119	615	991						
100	business				192	581	893						
100	summer					283	422						
200	all			119		991	1571						414
200	business			192	330	893	1365						226
200	summer				156	422	626						
500	all			353	615	1819	2903					517	884
500	business			383	581	1566	2466					276	471
500	summer		121	375	535	1257	1857						
1000	all		119	615	991	2903	4692					884	1415
1000	business		192	581	893	2466	4068					471	728

Table 2-6 Chronic Risk Zone

SAN FRANCISCO

500 hp

Hours of run time per year	Scenario	Interpolated Distance Downwind from BUG to risk of						Interpolated Distance Upwind from BUG to risk of					
		100 per million	50 per million	10 per million	5 per million	1 per million	0.5 per million	100 per million	50 per million	10 per million	5 per million	1 per million	0.5 per million
50	all			53	97	321	504					111	199
50	business			70	111	275	409						0
50	summer			97	142	350	487						
100	all			97	158	504	763					199	354
100	business			111	166	409	584					216	350
100	summer		52	142	205	487	686						
200	all			158	264	763	1148				88	354	549
200	business		58	166	243	584	844				111	350	515
200	summer	52	84	205	302	686	982						91
500	all	29	97	321	504	1315	1733			111	199	637	969
500	business	70	111	275	409	957	1414			134	216	574	856
500	summer	97	142	350	487	1108	1616					107	164
1000	all	97	156	504	763	1998	3149			199	354	969	1487
1000	business	111	166	409	584	1393	2098			216	350	856	1288

1500 hp

Hours of run time per year	Scenario	Interpolated Distance Downwind from BUG to risk of						Interpolated Distance Upwind from BUG to risk of					
		100 per million	50 per million	10 per million	5 per million	1 per million	0.5 per million	100 per million	50 per million	10 per million	5 per million	1 per million	0.5 per million
50	all					243	420						
50	business					252	390						
50	summer			63	126	334	470						
100	all				112	420	686						235
100	business				141	390	555						262
100	summer			126	192	470	670						
200	all			112	203	686	1072					235	453
200	business			141	220	555	814					262	442
200	summer			192	282	670	960						
500	all			243	420	1231	1899					539	876
500	business			252	390	921	1352					519	795
500	summer	63	126	334	470	1082	1570					0	0
1000	all		112	420	686	1899	2998				235	876	1092
1000	business		141	390	555	1352	2028				262	795	1216

Appendix 2-7 Emission Factor Sensitivity Analysis

Table VIII. Emission Factor Sensitivity Analysis - Intake Fraction Approach

	Cancer Cases			PM Mortality		
Run Hours Emission Factor Source	100 hours	500 hours	1000 hours	100 hours	500 hours	1000 hours
AP-42	4	22	44	59	295	590
ARB Estimate*	8	41	82	109	543	1086
AP-42 Reversed**	5	26	53	70	350	699

AP-42 Emission Factors

EF (>600 hp)	0.0007	lb/hp-hr
EF (<600 hp)	0.0022	lb/hp-hr
Cancer cases per (run hr*IF*EF)	4.4E-07	
Excess deaths per (run hr*IF*EF)	5.9E-06	

BUG Size Range (kW)	Middle BUG Size for this Range (kW)	Number of BUGs in State	Annual Run Hours per Engine	Total Run Hours	IF (per million)	EF (lb/hr)	Size (hp)	Chronic Cancer Cases (per			PM Mortality		
								100 hours	500 hours	1000 hours	100 hours	500 hours	1000 hours
0-100 kW	50	2,269	100	226,933	14.6	0.15	67	0.22	1.09	2.18	2.9	15	29
101-200 kW	150	2,269	100	226,933	14.6	0.44	201	0.65	3.27	6.54	8.7	44	87
201-300 kW	250	2,269	100	226,933	14.6	0.74	335	1.09	5.45	10.90	15	73	145
301-400	350	118	100	11,839	14.6	1.03	469	0.08	0.40	0.80	1.1	5	11
401-500	450	868	100	86,822	14.6	0.42	603	0.24	1.19	2.39	3	16	32
501-600	550	688	100	68,764	14.6	0.52	738	0.23	1.16	2.31	3	15	31
601-700	650	588	100	58,838	14.6	0.61	872	0.23	1.17	2.34	3	16	31
701-800	750	255	100	25,473	14.6	0.70	1,006	0.12	0.58	1.17	1.6	8	16
801-900	850	508	100	50,826	14.6	0.80	1,140	0.26	1.32	2.64	4	18	35
901-1000	950	184	100	18,417	14.6	0.89	1,274	0.11	0.53	1.07	1.4	7	14
1001-1100	1,050	255	100	25,473	14.6	0.99	1,408	0.16	0.82	1.63	2.2	11	22
1101-1200	1,150	161	100	16,145	14.6	1.08	1,542	0.11	0.57	1.13	1.5	8	15
1201-1300	1,250	73	100	7,295	14.6	1.17	1,676	0.06	0.28	0.56	0.7	4	7
1301-1400	1,350	159	100	15,905	14.6	1.27	1,810	0.13	0.66	1.31	1.7	9	17
1401-1500	1,450	37	100	3,707	14.6	1.36	1,944	0.03	0.16	0.33	0.4	2	4
1501-1600	1,550	260	100	25,951	14.6	1.45	2,079	0.25	1.23	2.46	3	16	33
1601-1700	1,650	44	100	4,425	14.6	1.55	2,213	0.04	0.22	0.45	0.6	3	6
1701-1800	1,750	39	100	3,946	14.6	1.64	2,347	0.04	0.21	0.42	0.6	3	6
1801-1900	1,850	28	100	2,751	14.6	1.74	2,481	0.03	0.16	0.31	0.4	2	4
1901-2000	1,950	74	100	7,415	14.6	1.83	2,615	0.09	0.44	0.88	1.2	6	12
2001-2100	2,050	164	100	16,384	14.6	1.92	2,749	0.21	1.03	2.05	2.7	14	27
more	2,150	32	100	3,229	14.6	2.02	2,883	0.04	0.21	0.42	0.6	3	6
Total		**11,344**	**100**	**1,134,404**		**24.3**		**4.4**	**22**	**44**	**59.0**	**295**	**590**

AP-42 Reversed

EF (>600 hp)	0.0022	lb/hp-hr
EF (<600 hp)	0.0007	lb/hp-hr
Cancer cases per (run hr*IF*EF)	4.4E-07	
Excess deaths per (run hr*IF*EF)	6.2E-06	

BUG Size Range (kW)	Middle BUG Size for this Range (kW)	Number of BUGs in State	Annual Run Hours per Engine	Total Run Hours	IF (per million)	EF (lb/hr)	Size (hp)	Chronic Cancer Cases (per			PM Mortality		
								100 hours	500 hours	1000 hours	100 hours	500 hours	1000 hours
0-100 kW	50	2,269	100	226,933	14.6	0.05	67	0.07	0.35	0.69	0.9	5	9
101-200 kW	150	2,269	100	226,933	14.6	0.14	201	0.21	1.04	2.08	2.8	14	28
201-300 kW	250	2,269	100	226,933	14.6	0.23	335	0.35	1.73	3.47	5	23	46
301-400	350	118	100	11,839	14.6	0.33	469	0.03	0.13	0.25	0.3	2	3
401-500	450	868	100	86,822	14.6	1.33	603	0.75	3.75	7.51	10	50	100
501-600	550	688	100	68,764	14.6	1.62	738	0.73	3.63	7.27	10	48	97
601-700	650	588	100	58,838	14.6	1.92	872	0.73	3.67	7.35	10	49	98
701-800	750	255	100	25,473	14.6	2.21	1,006	0.37	1.84	3.67	4.9	24	49
801-900	850	508	100	50,826	14.6	2.51	1,140	0.83	4.15	8.30	11	55	111
901-1000	950	184	100	18,417	14.6	2.80	1,274	0.34	1.68	3.36	4.5	22	45
1001-1100	1,050	255	100	25,473	14.6	3.10	1,408	0.51	2.57	5.14	6.8	34	68
1101-1200	1,150	161	100	16,145	14.6	3.39	1,542	0.36	1.78	3.57	4.7	24	47
1201-1300	1,250	73	100	7,295	14.6	3.69	1,676	0.18	0.88	1.75	2.3	12	23
1301-1400	1,350	159	100	15,905	14.6	3.98	1,810	0.41	2.06	4.13	5.5	27	55
1401-1500	1,450	37	100	3,707	14.6	4.28	1,944	0.10	0.52	1.03	1.4	7	14
1501-1600	1,550	260	100	25,951	14.6	4.57	2,079	0.77	3.86	7.73	10	51	103
1601-1700	1,650	44	100	4,425	14.6	4.87	2,213	0.14	0.70	1.40	1.9	9	19
1701-1800	1,750	39	100	3,946	14.6	5.16	2,347	0.13	0.66	1.33	1.8	9	18
1801-1900	1,850	28	100	2,751	14.6	5.46	2,481	0.10	0.49	0.98	1.3	7	13
1901-2000	1,950	74	100	7,415	14.6	5.75	2,615	0.28	1.39	2.78	3.7	18	37
2001-2100	2,050	164	100	16,384	14.6	6.05	2,749	0.65	3.23	6.45	8.6	43	86
more	2,150	32	100	3,229	14.6	6.34	2,883	0.13	0.67	1.33	1.8	9	18
Total		**11,344**	**100**	**1,134,404**		**69.8**		**8.2**	**41**	**82**	**108.6**	**543**	**1,086**

ARB Estimate

EF (>600 hp)	0.00121	lb/hp-hr
EF (<600 hp)	0.00121	lb/hp-hr
Cancer cases per (run hr*IF*EF)	4.4E-07	
Excess deaths per (run hr*IF*EF)	6.2E-06	

BUG Size Range (kW)	Middle BUG Size for this Range (kW)	Number of BUGs in State	Annual Run Hours per Engine	Total Run Hours	IF (per million)	EF (lb/hr)	Size (hp)	Chronic Cancer Cases (per			PM Mortality		
								100 hours	500 hours	1000 hours	100 hours	500 hours	1000 hours
0-100 kW	50	2,269	100	226,933	14.6	0.08	67	0.12	0.60	1.20	1.6	8	16
101-200 kW	150	2,269	100	226,933	14.6	0.24	201	0.36	1.80	3.60	4.8	24	48
201-300 kW	250	2,269	100	226,933	14.6	0.41	335	0.60	3.00	5.99	8	40	80
301-400	350	118	100	11,839	14.6	0.57	469	0.04	0.22	0.44	0.6	3	6
401-500	450	868	100	86,822	14.6	0.73	603	0.41	2.06	4.13	5	27	55
501-600	550	688	100	68,764	14.6	0.89	738	0.40	2.00	4.00	5	27	53
601-700	650	588	100	58,838	14.6	1.05	872	0.40	2.02	4.04	5	27	54
701-800	750	255	100	25,473	14.6	1.22	1,006	0.20	1.01	2.02	2.7	13	27
801-900	850	508	100	50,826	14.6	1.38	1,140	0.46	2.28	4.56	6	30	61
901-1000	950	184	100	18,417	14.6	1.54	1,274	0.18	0.92	1.85	2.5	12	25
1001-1100	1,050	255	100	25,473	14.6	1.70	1,408	0.28	1.41	2.83	3.8	19	38
1101-1200	1,150	161	100	16,145	14.6	1.87	1,542	0.20	0.98	1.96	2.6	13	26
1201-1300	1,250	73	100	7,295	14.6	2.03	1,676	0.10	0.48	0.96	1.3	6	13
1301-1400	1,350	159	100	15,905	14.6	2.19	1,810	0.23	1.13	2.27	3.0	15	30
1401-1500	1,450	37	100	3,707	14.6	2.35	1,944	0.06	0.28	0.57	0.8	4	8
1501-1600	1,550	260	100	25,951	14.6	2.52	2,079	0.43	2.13	4.25	6	28	57
1601-1700	1,650	44	100	4,425	14.6	2.68	2,213	0.08	0.39	0.77	1.0	5	10
1701-1800	1,750	39	100	3,946	14.6	2.84	2,347	0.07	0.36	0.73	1.0	5	10
1801-1900	1,850	28	100	2,751	14.6	3.00	2,481	0.05	0.27	0.54	0.7	4	7
1901-2000	1,950	74	100	7,415	14.6	3.16	2,615	0.15	0.76	1.53	2.0	10	20
2001-2100	2,050	164	100	16,384	14.6	3.33	2,749	0.35	1.77	3.55	4.7	24	47
more	2,150	32	100	3,229	14.6	3.49	2,883	0.07	0.37	0.73	1.0	5	10
Total		**11,344**	**100**	**1,134,404**		**39.3**		**5.3**	**26**	**53**	**69.9**	**350**	**699**

* ARB intermediate emission factor estimate of 0.55 g/hp-hr

** AP-42 assigns engines larger than 600 hp with an EF of 0.32 g/hp-hr, and engines smaller than 600 hp an EF value of 1.00 g/hp-hr.To determine the sensitivity of our risk results we switched the EF values for large and small engines.

Appendix 3-1

This Sheet provides a summary of Sagendorf and Dickson (1974), based on Oettl et al. (2001).

Q	Emissions Rate	micrograms/s	32000

		Observed Concentrations (micrograms/m3)			CU/Q		
Test No.	Wind Speed at 8 m	100 m	200 m	400 m	100 m	200 m	400 m
4	1.35	155	80	39	0.00654	0.00338	0.00165
5	1.2	48	31	11	0.00180	0.00116	0.00041
7	0.4	45	25	36	0.00056	0.00031	0.00045
8	0.6	36	13	13	0.00068	0.00024	0.00024
9	0.9	44	23	16	0.00124	0.00065	0.00045
10	2.1	45	34	13	0.00295	0.00223	0.00085
11	2.3	38	18	18	0.00273	0.00129	0.00129
12	1.1	58	52	29	0.00199	0.00179	0.00100
13	2	65	48	28	0.00406	0.00300	0.00175
14	2	60	34	6	0.00375	0.00213	0.00038
AVERAGE	1.4	59	36	21	0.00263	0.00162	0.00085

Standard Deviation	0.7	35	20	11	0.00182	0.00108	0.00055
mean + 1*SD	2.1	94	56	32	0.00445	0.00270	0.00140
mean - 1*SD	0.7	25	16	10	0.00081	0.00054	0.00029

Note: The emissions rate of 0.032 mg/s listed in Oettl et al. is probably a typo that should be 0.032 g/s.

Sources:

Sagendorf, JF and Dickson, CR. Diffusion under low wind-speed, inversion conditions. 1974. NOAA Technical Memo. ERL ARL-52.

Cited in Oettl D, Almbauer RA, and Sturm PJ. A New Method to Estimate Diffusion in Stable, Low-Wind Conditions. *J App Meteor*. **40,** 259-268. 2001.

Appendix 3-2

Goal: To predict a concentration during calm hours using data from Sagendorf and Dickson (1974).

Assumptions:

Wind speed (u)	m/s	0.5	Assumption for this calculation
PM Emissions (Q)	lb/hr	1.1	Emissions for the 500 hp engine
PM Emissions (Q)	ug/s	138597	= 1.1*453.59*1000000/3600
24-hour PM10 standard	ug/m3	50	Cal EPA
Proposed 24-hour PM2.5 standard	ug/m3	65	US EPA (NAAQS)
Average PM10 concentration, LA County 1996-2001	ug/m3	37	Based on the EPA AIRS database

Typical ambient PM10 concentrations are used in some of the calculations below for illustrative purposes only. Each geographic

Range of Values from Sagendorf and Dickson (1974)

		High			Low		
distance downwind	m	100	200	400	100	200	400
Max CU/Q	m^{-2}	4.5E-03	2.7E-03	1.4E-03	8.1E-04	5.4E-04	2.9E-04

"High" is the mean plus one standard deviation, and "low" is the mean minus one standard deviation.
Values are taken from Appendix 3-1.

Calculated Concentration

C/Q	s/m3	8.90E-03	5.40E-03	2.80E-03	1.62E-03	1.07E-03	5.85E-04	= (CU/Q) / U
C	ug/m3	1234	748	388	224	149	81	= (C/Q) * Q

Number of Hours of Calms required to Exceed the Cal EPA 24-Hour PM10 Standard

	High			Low		
Assumption:	100	200	400	100	200	400
Concentrations are zero the rest of the day.	1.0	1.6	3.1	5.3	8.1	14.8
Concentrations are equal to typical background concentraions the rest of the day.	0.3	0.5	0.9	1.7	2.9	7.2
Concentrations are equal to typical background concentraions for all hours of the day, and the BUG emissions are additive to the background.	0.3	0.4	0.8	1.4	2.2	4.0

Number of Hours of Calms required to Exceed the proposed US EPA 24-Hour PM2.5 Standard

	High					
	100	200	400	100	200	400
Concentrations are zero the rest of the day.	1.3	2.1	4.0	6.9	10.5	19.2
Concentrations are equal to typical background concentraions the rest of the day.	0.6	1.0	1.9	3.6	6.1	15.3
Concentrations are equal to typical background concentraions for all hours of the day, and the BUG emissions are additive to the background.	0.6	0.9	1.8	3.0	4.6	8.4

Chronic Cancer risk, as a function of the Number of Hours of operation during Calms

	Annual Average Concentration (micrograms/m3) due to Operating During Calm Hours					
	High			Low		
Number of Calm Hours that BUG runs.	100	200	400	100	200	400
1	0.1	0.1	0.0	0.03	0.02	0.01
2	0.3	0.2	0.1	0.05	0.03	0.02
3	0.4	0.3	0.1	0.08	0.05	0.03
4	0.6	0.3	0.2	0.10	0.07	0.04
5	0.7	0.4	0.2	0.13	0.09	0.05
10	1.4	0.9	0.4	0.26	0.17	0.09
15	2.1	1.3	0.7	0.38	0.26	0.14
20	2.8	1.7	0.9	0.51	0.34	0.19
25	3.5	2.1	1.1	0.64	0.43	0.23
30	4.2	2.6	1.3	0.77	0.51	0.28
50	7.0	4.3	2.2	1.28	0.85	0.46
100	14.1	8.5	4.4	2.56	1.70	0.93

	Risk (per million) due to Operating During Calm Hours					
	High			Low		
Number of Calm Hours that BUG runs.	100	200	400	100	200	400
0	0	0	0	0	0	0
1	42	26	13	8	5	3
2	85	51	27	15	10	6
3	127	77	40	23	15	8
4	169	102	53	31	20	11
5	211	128	67	38	26	14
10	423	256	133	77	51	28
15	634	384	200	115	77	42
20	845	512	266	154	102	56
25	1056	640	333	192	128	69
30	1268	768	399	231	153	83
50	2113	1281	665	384	255	139
100	4225	2561	1330	769	510	278

	Risk (per million) due to Operating During Calm Hours					
	Mean			Standard Deviation		
Number of Calm Hours that BUG runs.	100 m	200 m	400 m	100	200	400
0	0	0	0	0	0	0
1	25	15	8	17	10	5
2	50	31	16	35	21	11
3	75	46	24	52	31	16
4	100	61	32	69	41	21
5	125	77	40	86	51	26
10	250	154	80	173	103	53
15	375	230	121	259	154	79
20	499	307	161	346	205	105
25	624	384	201	432	256	132
30	749	461	241	518	308	158
50	1249	768	402	864	513	263
100	2497	1536	804	1728	1026	526

Appendix 3-3

Goal: To predict a concentration during calm hours using an expanding box-model

Assumptions:

Wind speed (u)	m/s	0.5	Assumption for this calculation
PM Emissions (Q)	lb/hr	1.1	Emissions for the 500 hp engine
PM Emissions (Q)	ug/s	138597	= 1.1*453.59*1000000/3600
24-hour PM10 standard	ug/m3	50	Cal EPA
Proposed 24-hour PM2.5 standard	ug/m3	65	US EPA (NAAQS)
Average PM10 concentration, LA County 1996-2001	ug/m3	37	Based on the EPA AIRS database
Increase in spread due to horizontal meandering	-	6	Wilson et al. (1976)

Reference: Wilson RC, Start GE, Dickson CR, and Ricks NR. Diffusion under low wind speed conditions near Oak Ridge, Tennessee. 1976. NOAA Technical Memo. ERL ARL-61.
Cited in: Brusasca G, Tinarelli, G, and Anfossi G. Particle Model Simulations of Diffusion in Low Wind Speed Stable Conditions. *Atm Env* ***26A(4)****, 707-723. 1992*.

Typical ambient PM10 concentrations are used in some of the calculations below for illustrative purposes only. Each geographic are will have different background ambient concentrations.

Spread in Plume, based on Pasquill Stability Class

		High (Stability Class F)			Low (Stability Class A)		
distance downwind	m	100	200	400	100	200	400
σ_z	m	2	4	7	14	29	72
σ_y - without meandering	m	4	8	15	27	50	93
σ_y - with meandering	m	24	46	88	160	300	558

"With meandering" means that the plume width has been increased by a factor of 6 to account for the additional meandering due to calm conditions. The calculations below use "meander" value.

The values of σ_y and σ_z represent the plume half-width and half-height, so they have been multiplied by 2 to find the plume height and width below.

Calculated Concentration

C/Q	m3/s	9.1E-03	2.6E-03	7.9E-04	2.2E-04	5.7E-05	1.3E-05	= 1/(U * 2σ_y * 2σ_z)
C	ug/m3	1255	361	110	31	7.9	1.7	= (C/Q) * Q

Number of Hours of Calms required to Exceed the Cal EPA 24-Hour PM10 Standard

	High			Low		
Assumption:	100	200	400	100	200	400
Concentrations are zero the rest of the day.	1.0	3.3	10.9	-	-	-
Concentrations are equal to typical background concentraions the rest of the day.	0.3	1.0	4.4	-	-	-
Concentrations are equal to typical background concentraions for all hours of the day, and the BUG emissions are additive to the background.	0.3	0.9	2.9	10.5	-	-

Number of Hours of Calms required to Exceed the proposed US EPA 24-Hour PM2.5 Standard

	High			Low		
	100	200	400	100	200	400
Concentrations are zero the rest of the day.	1.2	4.3	14.2	-	-	-
Concentrations are equal to typical background concentraions the rest of the day.	0.6	2.1	9.3	-	-	-

Concentrations are equal to typical background concentraions for all hours of the day, and the BUG emissions are additive to the background.	0.5	1.9	6.2	22.3	-	-

Chronic Cancer risk, as a function of the Number of Hours of operation during Calms

	Annual Average Concentration (micrograms/m3) due to Operating During Calm Hours					
	High			Low		
Number of Calm Hours that BUG runs.	100	200	400	100	200	400
1	0.143	0.041	0.013	0.003	0.001	0.000
2	0.286	0.082	0.025	0.007	0.002	0.000
3	0.430	0.124	0.038	0.010	0.003	0.001
4	0.573	0.165	0.050	0.014	0.004	0.001
5	0.716	0.206	0.063	0.017	0.005	0.001
10	1.432	0.412	0.125	0.035	0.009	0.002
15	2.149	0.618	0.188	0.052	0.014	0.003
20	2.865	0.824	0.250	0.070	0.018	0.004
25	3.581	1.029	0.313	0.087	0.023	0.005
30	4.297	1.235	0.376	0.105	0.027	0.006
50	7.162	2.059	0.626	0.175	0.045	0.010
100	14.325	4.118	1.252	0.349	0.091	0.020

	Risk (per million) due to Operating During Calm Hours					
	High			Low		
Number of Calm Hours that BUG runs.	100	200	400	100	200	400
0	0	0	0	0	0	0
1	43	12	4	1.0	0.3	0.1
2	86	25	8	2.1	0.5	0.1
3	129	37	11	3.1	0.8	0.2
4	172	49	15	4.2	1.1	0.2
5	215	62	19	5.2	1.4	0.3
10	430	124	38	10.5	2.7	0.6
15	645	185	56	15.7	4.1	0.9
20	859	247	75	21.0	5.4	1.2
25	1074	309	94	26.2	6.8	1.5
30	1289	371	113	31.5	8.2	1.8
50	2149	618	188	52.4	13.6	3.0
100	4297	1235	376	104.8	27.2	5.9

	Mean			Standard Deviation		
Number of Calm Hours that BUG runs.	100 m	200 m	400 m	100	200	400
0	0	0	0	0	0	0
1	22.0	6.3	1.9	21.0	6.0	1.8
2	44.0	12.6	3.8	41.9	12.1	3.7
3	66.0	18.9	5.7	62.9	18.1	5.5
4	88.0	25.3	7.6	83.9	24.2	7.4
5	110.1	31.6	9.5	104.8	30.2	9.2
10	220.1	63.1	19.1	209.6	60.4	18.5
15	330.2	94.7	28.6	314.4	90.6	27.7
20	440.2	126.3	38.2	419.3	120.8	37.0
25	550.3	157.8	47.7	524.1	151.0	46.2
30	660.3	189.4	57.2	628.9	181.2	55.5
50	1100.6	315.6	95.4	1048.1	302.0	92.4
100	2201.1	631.3	190.8	2096.3	604.1	184.9

Figure 3-1
Average Number of Hours of Calms per Day, San Francisco

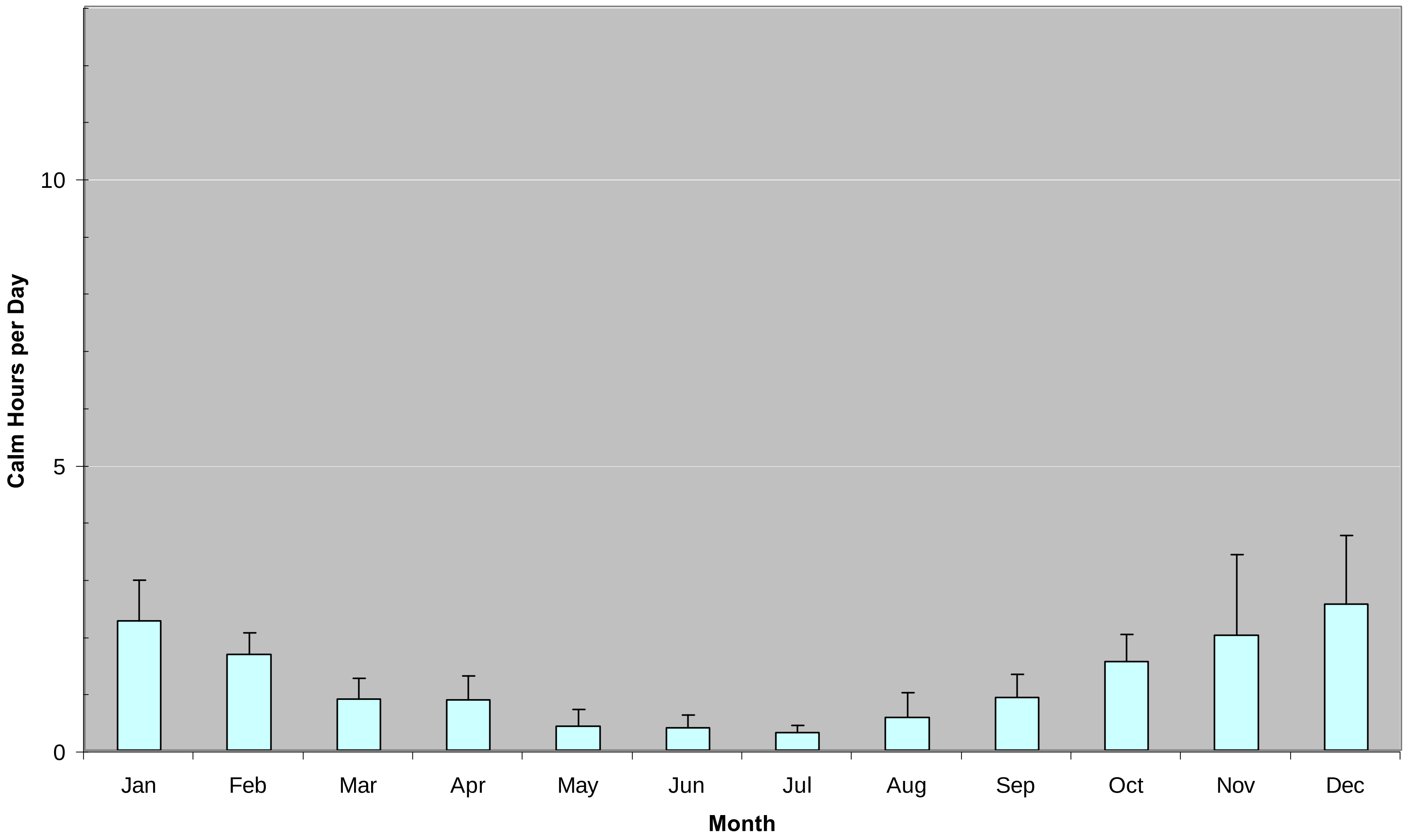


Figure 3-1
Average Number of Hours of Calms per Day, San Francisco

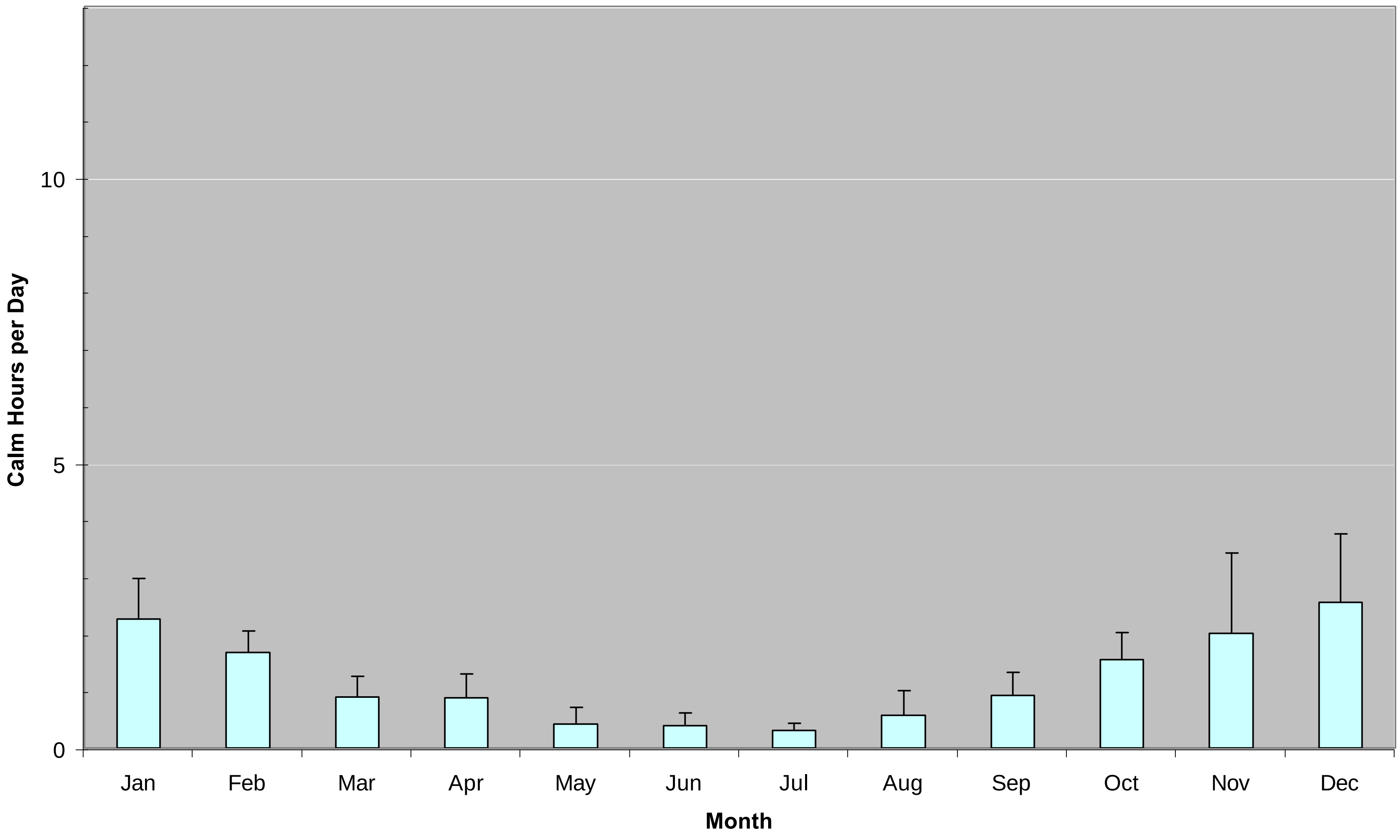


Figure 3-1
Average Number of Hours of Calms per Day, San Diego

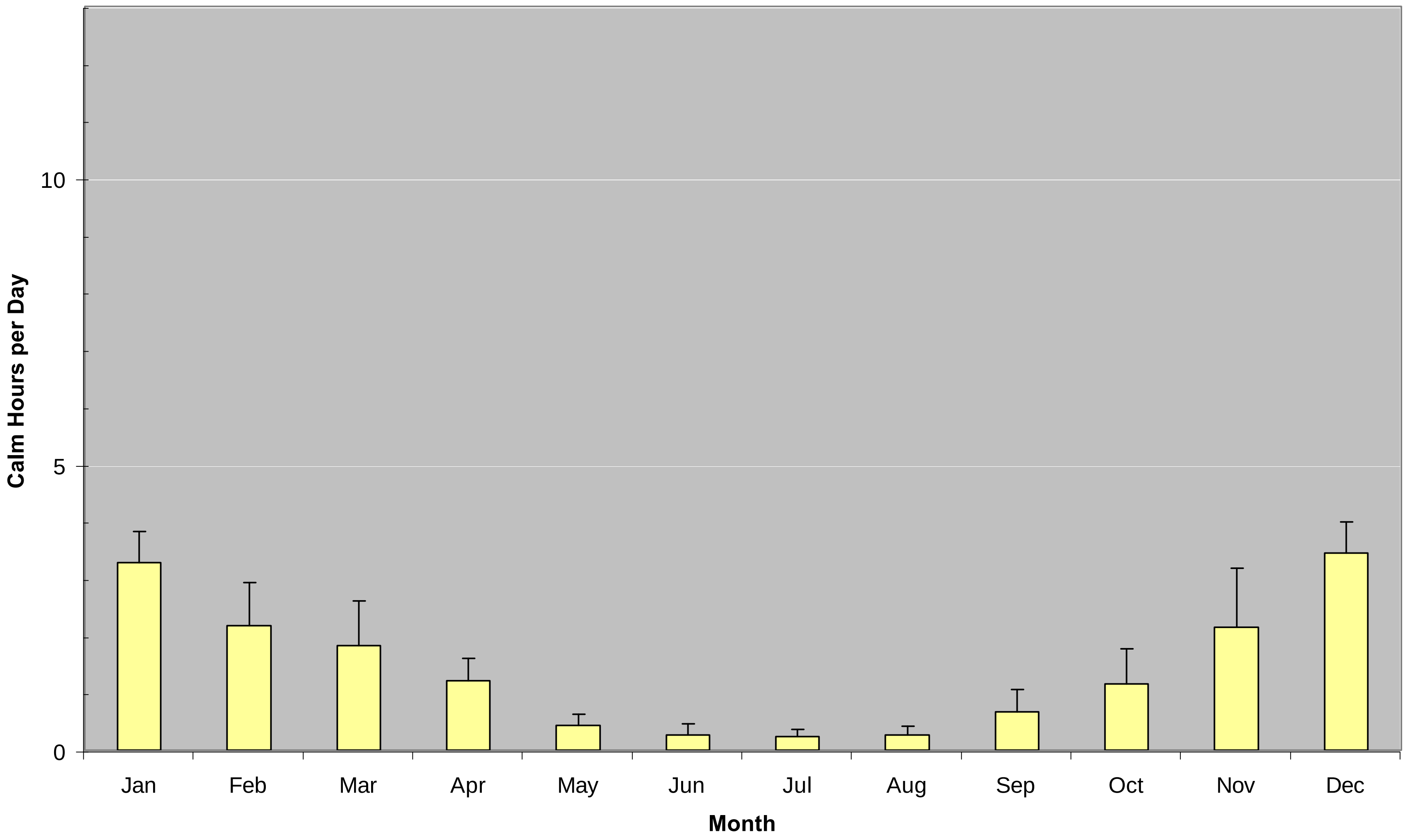


Figure 3-1
Average Number of Hours of Calms per Day, Los Angeles

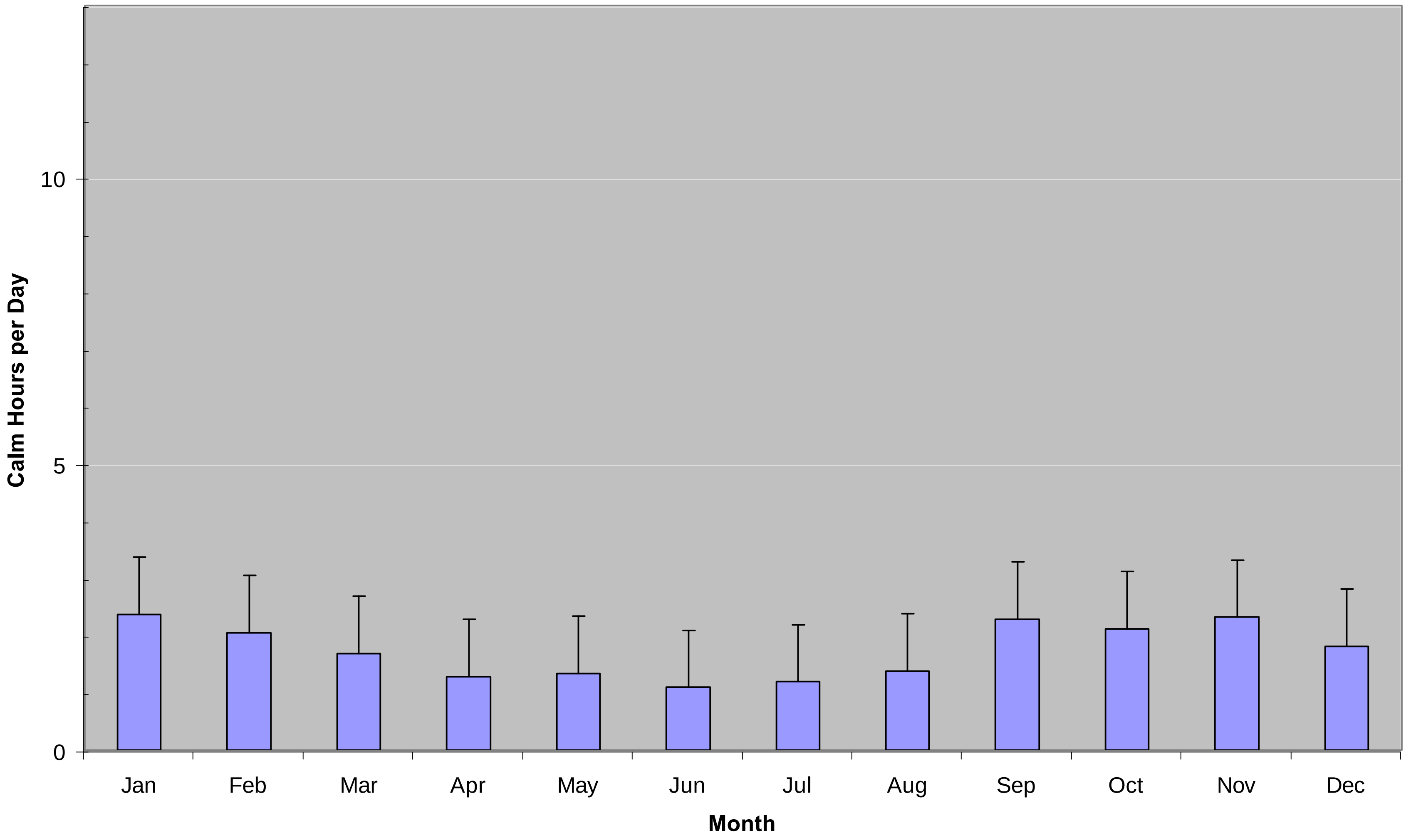
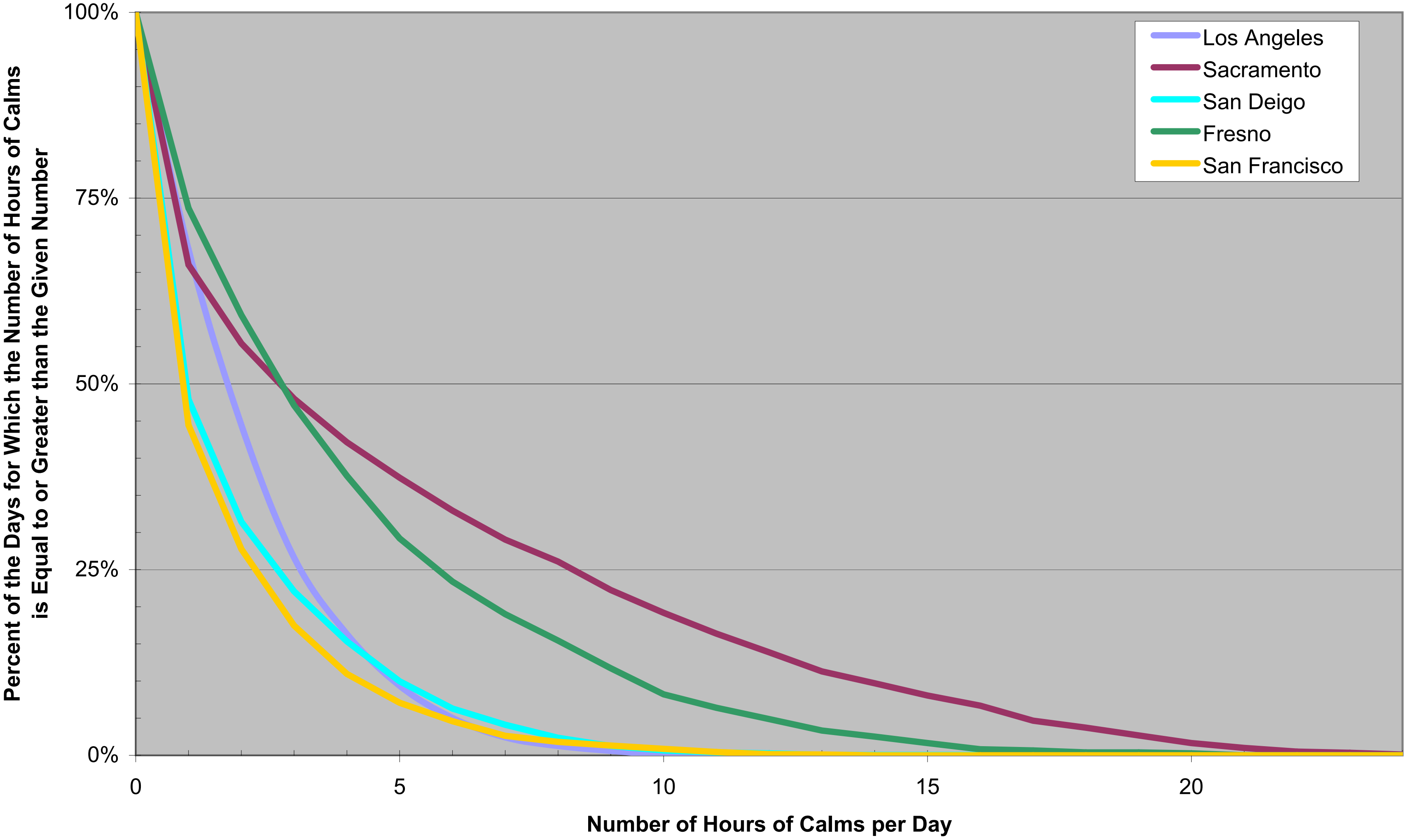
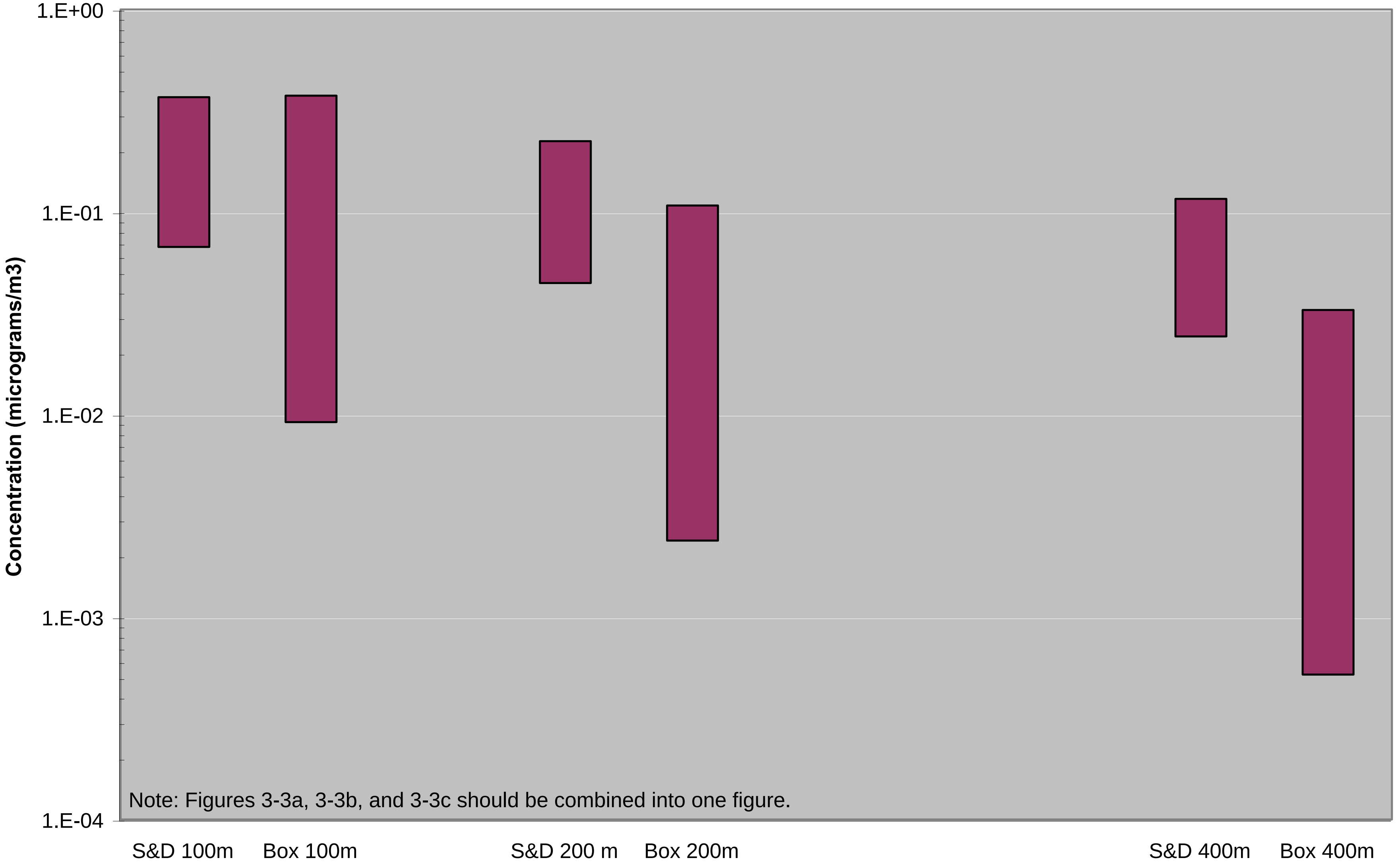
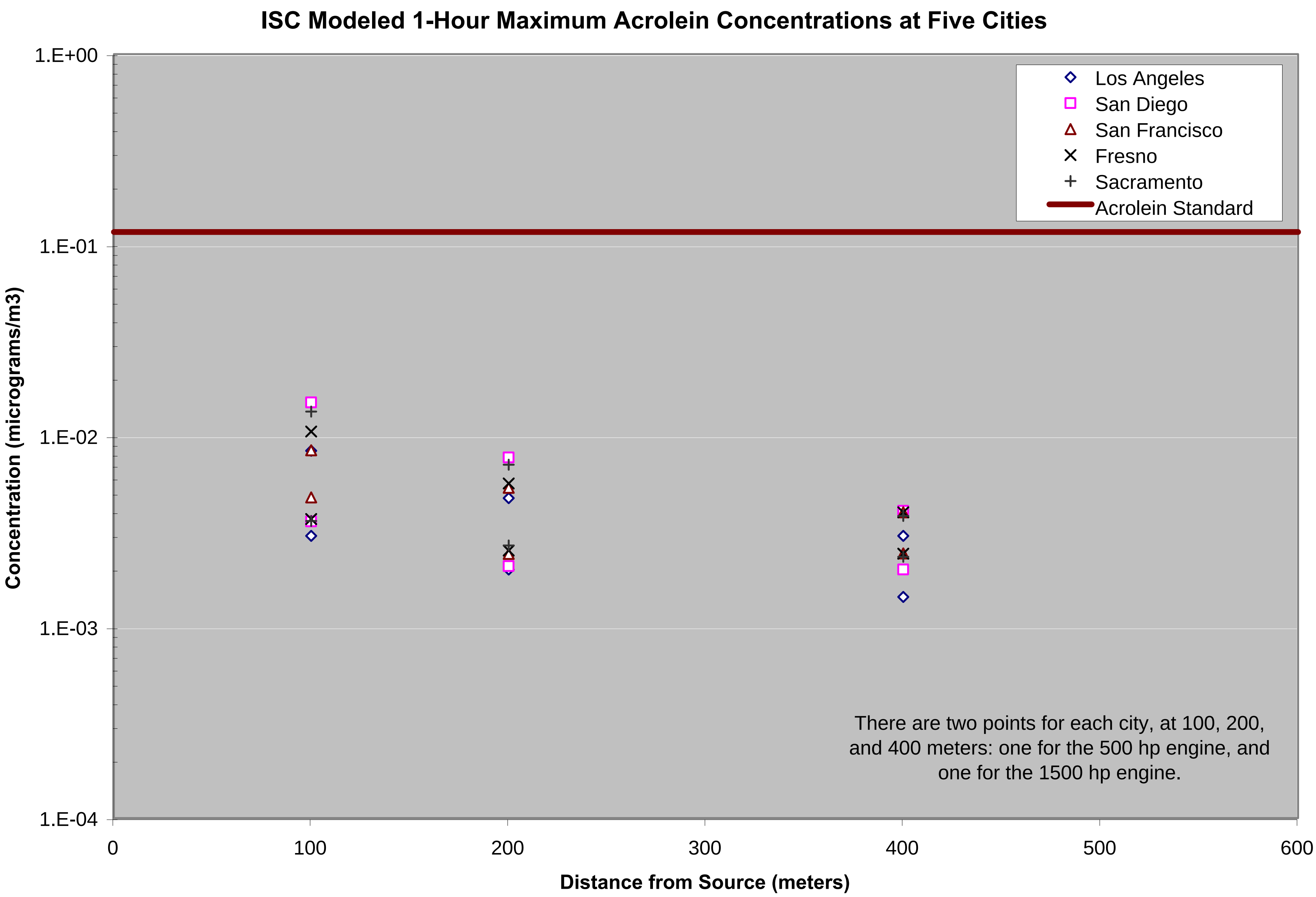


Figure 3-2:
Number of Calm Hours per Day
(Reverse-Cumulative)



Acrolein Concentration during a Calm Hour, as Predicted by the S&D and Box Methologies





ISC Modeled 1-Hour Maximum Acrolein Concentrations at Five Cities

There are two points for each city, at 100, 200, and 400 meters: one for the 500 hp engine, and one for the 1500 hp engine.

Appendix 3-4

Goal: To Compare ISC predictions with S&D and the box model, for 1-hour concentration

Calculated PM Concentration

		High			Low		
Distance Down-wind	m	100	200	400	100	200	400
S&D	ug/m3	1234	748	388	224	149	81
Box Model	ug/m3	1255	361	110	31	7.9	1.7

Compare These Concentrations with the ISC Modeled 1-Hour Maximum PM Concentration

Presented as the ratio of two concentrations: the model output and the prediction using the box-model and using S&D.

					Comparison with Box						Comparison with S&D					
		Modeled Concentration (ug/m3)			High			Low			High			Low		
Model Run number	Model Run Name	100	200	400	100	200	400	100	200	400	100	200	400	100	200	400
LA1	LA-1H-all-500	28	16	10	45	23	11	1.1	0.5	0.2	44	47	39	8	9	8
LA2	LA-1H-all-1500	10	7	5	125	54	23	3.0	1.2	0.4	123	112	81	22	22	17
LA3	LA-1H-sum-500	15	4	1	86	85	95	2.1	1.9	1.5	85	176	338	15	35	71
LA4	LA-1H-sum-1500	9	4	1	144	99	104	3.5	2.2	1.7	141	204	370	26	41	77
LA5	LA-1H-bus-500	28	15	9	44	24	12	1.1	0.5	0.2	44	51	42	8	10	9
LA6	LA-1H-bus-1500	12	7	6	107	49	18	2.6	1.1	0.3	106	102	63	19	20	13
SD1	SD-1H-all-500	50	26	14	25	14	8	0.6	0.3	0.1	25	29	29	4	6	6
SD2	SD-1H-all-1500	12	7	7	105	52	16	2.6	1.1	0.3	103	107	58	19	21	12
SD3	SD-1H-sum-500	27	9	5	47	38	21	1.1	0.8	0.3	46	79	74	8	16	16
SD4	SD-1H-sum-1500	12	6	3	105	56	31	2.6	1.2	0.5	103	116	112	19	23	23
SD5	SD-1H-bus-500	50	26	14	25	14	8	0.6	0.3	0.1	25	29	29	4	6	6
SD6	SD-1H-bus-1500	12	7	7	105	52	16	2.6	1.1	0.3	103	107	58	19	21	12
SF1	SF-1H-all-500	28	18	13	45	20	8	1.1	0.4	0.1	44	42	29	8	8	6
SF2	SF-1H-all-1500	16	8	8	78	45	13	1.9	1.0	0.2	77	92	48	14	18	10
SF3	SF-1H-sum-500	22	7	2	56	49	53	1.4	1.1	0.8	55	103	186	10	20	39
SF4	SF-1H-sum-1500	12	5	2	108	67	59	2.6	1.5	0.9	107	138	209	19	28	44
SF5	SF-1H-bus-500	28	17	13	45	21	9	1.1	0.5	0.1	44	43	30	8	9	6
SF6	SF-1H-bus-1500	16	8	8	78	45	14	1.9	1.0	0.2	77	92	50	14	18	10
FR1	FR-1H-all-500	35	19	13	35	19	8	0.9	0.4	0.1	35	40	29	6	8	6
FR2	FR-1H-all-1500	12	8	8	102	43	14	2.5	0.9	0.2	100	89	48	18	18	10
FR3	FR-1H-sum-500	27	10	7	47	35	17	1.1	0.8	0.3	46	73	59	8	15	12
FR4	FR-1H-sum-1500	12	6	4	102	56	26	2.5	1.2	0.4	100	116	94	18	23	20
FR5	FR-1H-bus-500	35	19	10	35	19	11	0.9	0.4	0.2	35	40	38	6	8	8
FR6	FR-1H-bus-1500	12	8	7	102	43	16	2.5	0.9	0.3	100	89	58	18	18	12
SAC1	Sac-1H-all-500	45	24	13	28	15	9	0.7	0.3	0.1	27	32	30	5	6	6
SAC2	Sac-1H-all-1500	12	9	8	104	40	14	2.5	0.9	0.2	103	84	50	19	17	10
SAC3	Sac-1H-sum-500	27	11	5	46	33	24	1.1	0.7	0.4	45	68	86	8	14	18
SAC4	Sac-1H-sum-1500	12	6	3	105	57	35	2.5	1.3	0.6	103	119	126	19	24	26
SAC5	Sac-1H-bus-500	45	24	12	28	15	9	0.7	0.3	0.1	27	32	31	5	6	7
SAC6	SAC-1H-bus-1500	12	9	7	104	40	16	2.5	0.9	0.3	103	84	58	19	17	12

Appendix 3-5

Goal: To Determine how many hours a BUG would need to run in order to reach a risk level of 100 per million.

Calculated PM Concentration

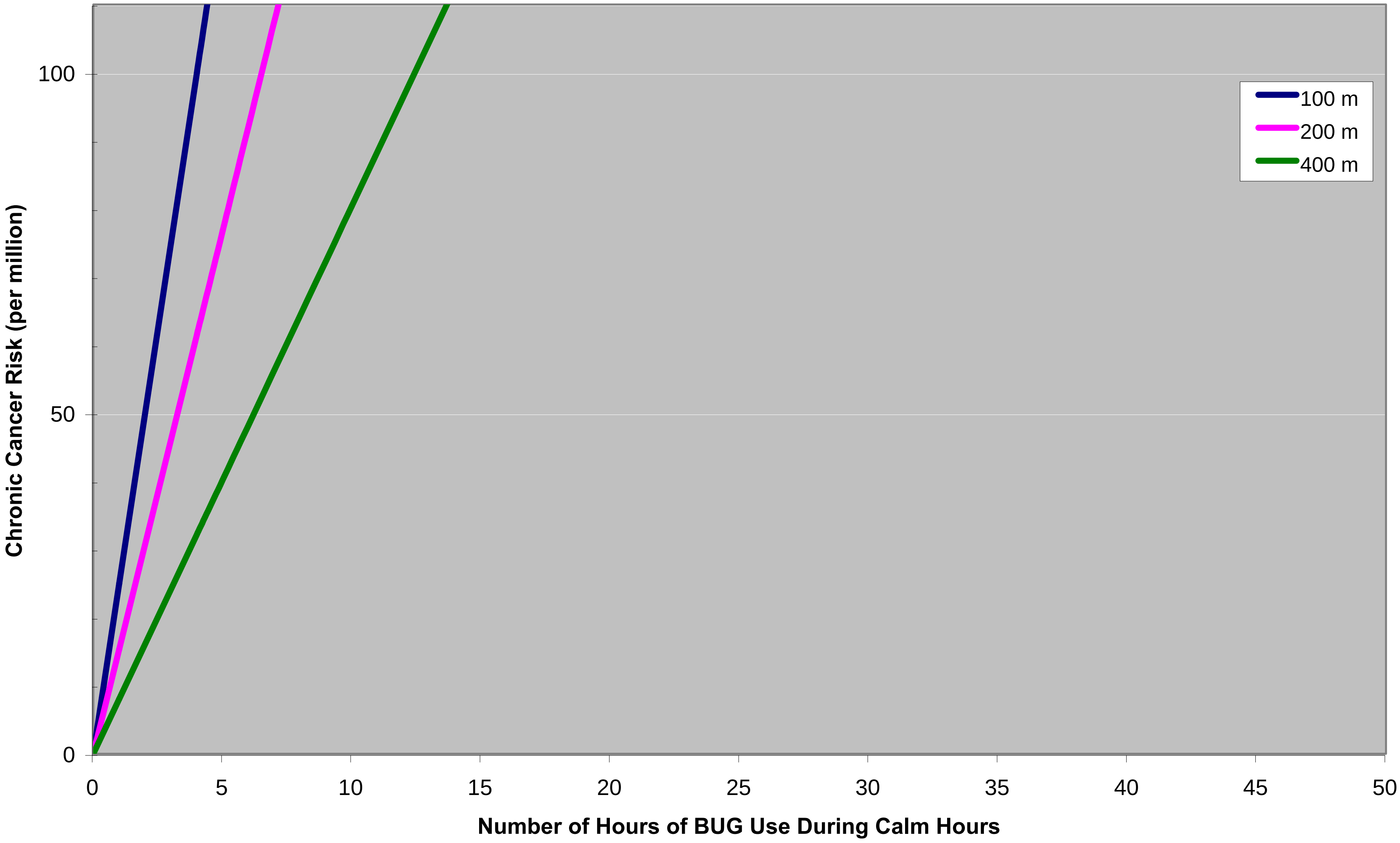
		High			Low		
Distance Down-wind	m	100	200	400	100	200	400
S&D	ug/m3	1234	748	388	224	149	81
Box Model	ug/m3	1255	361	110	31	7.9	1.7

Toxicity	300	per million per microgram/m3	
Risk	100	per million	Assumed value for this calculation.
Annual Ave Conc to yeild this risk	0.33	micrograms/m3	= (Risk) / (Toxicity) = (100) / (300).

Hours of BUG operation to reach risk level

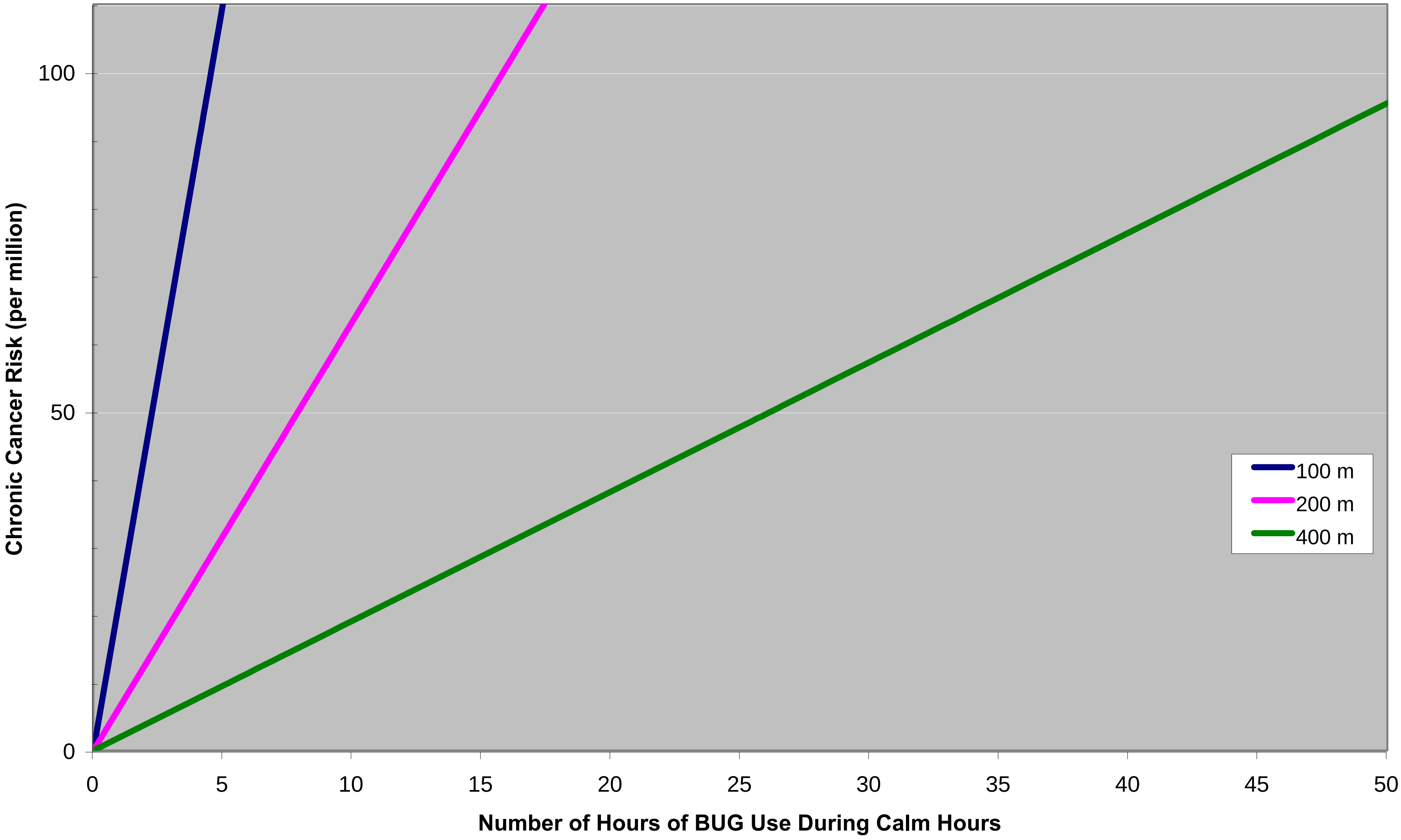
		High			Low		
Distance Down-wind	m	100	200	400	100	200	400
S&D		2.4	3.9	7.5	13.0	19.6	36.0
Box Model		2.3	8.1	26.6	95.4	367.4	1683.6

The number of hours necessary to cause an annual average concentration of 0.33 micrograms/m3 is (0.33) * (8760) / (calculated PM Concentration)

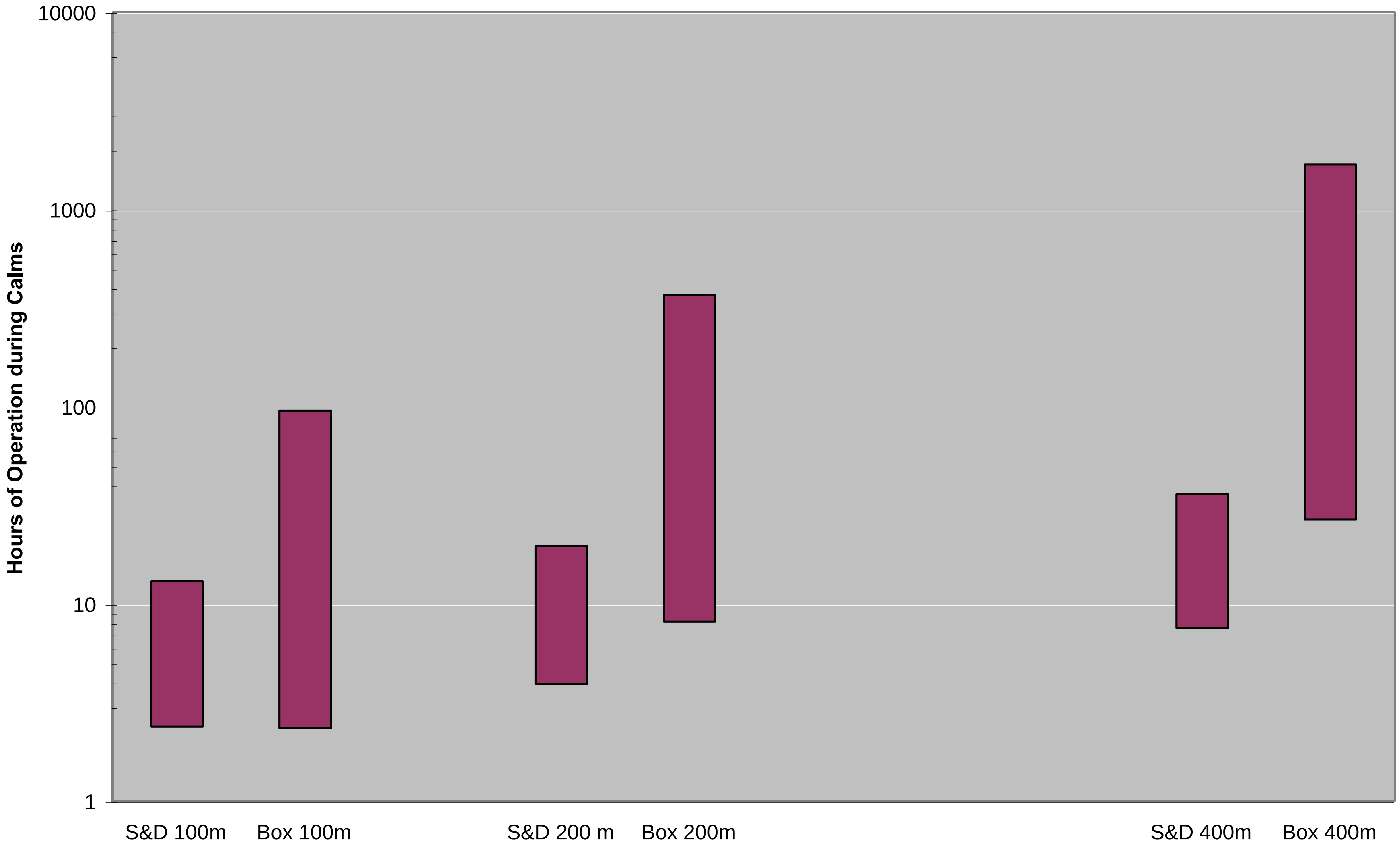


**Risk as a Function of BUG Use During Calm Hours,
Using data from Sagendorf and Dickson (1974).**

Risk as a Function of BUG Use During Calm Hours, Using a Box Model



Number of Hours of BUG Operation during Calm Conditions to Yield a 100 per Million Chronic Cancer Risk, as Predicted by the S&D and Box Methologies



Appendix 4

This Appendix contains the calculations that were used to determine a statewide intake fraction for diesel particulate matter (DPM). This was then used to calculate the chronic cancer and PM mortality risks associated with statewide engine use.

LIST OF TABLES/SPREADSHEETS

- **Spreadsheet 4-1 Chronic Cancer Risk**
  This spreadsheet uses the intake fraction approach to determine the total population-wide intake and chronic cancer risk due to diesel PM from BUGs. The intake fraction value of 16.2 and the emission factor value of 0.74 lb/hr reflect the weighted average from the five air basins based on the number of engines in each basin (see Table 4-5). By calculating total intake and total number of hours run, the excess chronic cancer risk is determined.

- **Spreadsheet 4-2 Mortality Risk**
  This spreadsheet uses the intake fraction approach to determine the total population-wide intake and mortality risk due to diesel PM 2.5 from BUGs.

- **Table 4-3 Engine Size Distribution**
  By breaking up the BUG population into size categories, we are able to adjust emission factors to better reflect the distribution of engine sizes. Then, using the intake fraction approach, we can determine the excess cancer and PM mortality risk from the various BUG sizes for 100, 500 and 1000 hours of annual run time.

- **Table 4-4 Permitted vs. Distributed Generation Use**
  This table illustrates the increase in both cancer and PM mortality risk as an increasing percent of BUGs are used for Distributed Generation (for which we assume 1000 hours per year of operation).

- **Table 4-5 Air Basin Intake Fractions**
  The calculation of air basin-specific intake fractions takes into account population, land area, and breathing rate of each air basin, as well as the DPM emissions and background concentrations for each.

Appendix 4-1: Intake Fraction, Chronic Cancer Risk

Goal: To use an intake fraction approach to determine the total population-wide intake and risk due to diesel PM from BUGs

Determine an intake-based toxicity

	Concentration-based toxicity:			
1	Exposure Concentration	1	microgram/m3	
2	Cancer Risk	300	per million	
3	Concentration-based Toxicity	300	per million per microgram/m3	= (2) / (1)
	Intake-based toxicity:			
4	Exposure Concentration	1	microgram/m3	
5	Breathing Rate	12	m3/day	From Layton (1993)
6	Lifetime	25,550	days	= 70 * 365
7	Lifetime intake	306,600	micrograms	= (4) * (5) * (6)
8	Lifetime intake	0.31	grams	= (7) / 1,000,000
9	Cancer Risk	300	per million	
10	Intake-based Toxicity	978	per million per gram	= (9) / (8)
11	Intake-based Toxicity	0.978	per kg	= (10) * 1,000 / 1,000,000
12	Unit Dose	1.02	kg	= 1/(11)

Here, unit dose is the dose that causes one cancer case.

Determine Total Intake

13	Emissions Factor	0.74	lb/hr	Weighted-average, from Appendix 4-3
14	Emissions Factor	334	g/hr	= (13) * 454 g/lb
15	Intake Fraction	0.0000146	-	Weighted-average, from Appendix 4-5
16	Incremental Intake	0.0049	g/hr	= (14) * (15)

Determine Excess Cancer Risk

17	Total Hours of BUG use, across all BUGs	1,134,400	hours/year	From Appendix 4-3
18	Total Emissions	379	tonnes/year	= (14) * (17) / 1,000,000
19	Total Intake	5.6	kg/year	= (15) * (18) * 1,000 = (16) * (17) / 1,000
20	Total Excess Cancer Cases from all BUGs	5.4	cancer cases per year	= (19) / (12)

References:

Layton, DW. (1993) Metabolically consistent breathing rates for use in dose assessments. Health Physics 64:23-35.

Lloyd AC and Cackette TA. Diesel Engines: Environmental Impact and Control. June 2001. Journal of the Air and Waste Management Association 51:809-847.

The breathing rate of 12 m3/day is based on the caloric intake method given in Layton (1993). It represents the population breathing rate, including men, women, children, and infants. A review of the literature on breathing rates is provided in Technical Support Document for Exposure Assessment and Stochastic Analysis, September 2000, available from http://www.oehha.ca.gov/air/hot_spots/pdf/chap3.pdf.

Chronic cancer toxicity values as they are typically presented are concentration-based toxicity, meaning that the units are in risk per concentration (e.g., risk per million per mg/m^3). Intake-based toxicity has units of risk per intake (e.g., risk per million per gram). The toxicity of 300 per million per mg/m^3 is equivalent to 978 per million per gram, because a lifetime of exposure to 1 mg/m^3 (which yields a risk of 300 per million) is equivalent to a total lifetime intake of 0.31 grams.

Appendix 4-2: Intake Fraction, Mortality Risk

Goal: To use an intake fraction approach to determine the total population-wide intake and risk due to PM2.5 from BUGs

Toxicity taken from Lloyd AC and Cackette TA. Diesel Engines: Environmental Impact and Control J. Air & Waste Manag. Assoc. 2001, 51:809-847.

Determine an intake-based toxicity

	Concentration-based toxicity:			
1	Exposure Concentration	1.81	microgram/m3	Direct Diesel PM2.5. From Lloyd and Cackette (2001).
2	Mortality	3566	people/year	Deaths/year due to direct (primary) and indirect (seconary) PM. From Lloyd and Cackette (2001).
3	California State Population	34.5	million people	http://quickfacts.census.gov/qfd/states/06000.html
4	Risk	103	per million per year	= (2) / (3)
5	Concentration-based Toxicity	57	per million per year per microgram/m3	= (4) / (1)
	Intake-based toxicity:			
6	Exposure Concentration	1.81	microgram/m3	Direct Diesel PM (from (1)).
7	Breathing Rate	12	m3/day	From Layton (1993)
8	Year	365	days per year	
9	Yearly Intake	7,928	micrograms per year	= (6) * (7) * (8)
10	Yearly Intake	0.0079	grams per year	= (9) / 1,000,000
11	Mortality Risk	103	per million per year	= (4)
12	Intake-based Toxicity	13038	per million per gram	= (11) / (10)
13	Intake-based Toxicity	13.038	per kg	= (12) * 1,000 / 1,000,000
14	Unit Dose	0.077	kg	= 1/(13)

Here, unit dose is the dose that causes one death.

Determine Total Intake

15	Emissions Factor	0.74	lb/hr	Weighted-average, from Appendix 4-3
16	Emissions Factor	334	g/hr	= (15) * 454 g/lb
17	Intake Fraction	0.0000146	-	Weighted-average, from Appendix 4-5
18	Incremental Intake	0.0049	g/hr	= (16) * (17)

Determine Excess Mortality Risk

19	Total Hours of BUG use, across all BUGs	1,134,400	hours/year	From Appendix 4-3
20	Total Emissions	379	tonne/yr	= (16) * (19)
21	Total Intake	5.6	kg/year	= (17) * (20) * 1000 = (19) * (18) / 1,000
22	Total Excess Deaths from all BUGs	72.4	deaths/year	= (21) / (14)

References:

Layton, DW. (1993) Metabolically consistent breathing rates for use in dose assessments. Health Physics 64:23-35.

Lloyd AC and Cackette TA. Diesel Engines: Environmental Impact and Control. June 2001. Journal of the Air and Waste Management Association 51:809-847.

The breathing rate of 12 m3/day is based on the caloric intake method given in Layton (1993). It represents the population breathing rate, including men, women, children, and infants. A review of the literature on breathing rates is provided in Technical Support Document for Exposure Assessment and Stochastic Analysis, September 2000, available from http://www.oehha.ca.gov/air/hot_spots/pdf/chap3.pdf.

Appendix 4-3: Intake Fraction, Engine Size Distribution

EF (>600 hp)	0.0007	lb/hp-hr
EF (<600 hp)	0.0022	lb/hp-hr
Cancer cases per (run hr*IF*EF)	4.4E-07	
Excess deaths per (run hr*IF*EF)	5.9E-06	

BUG Size Range (kW)	Middle BUG Size for this Range (kW)	Number of BUGs in State	Annual Run Hours per Engine	Total Run Hours	IF (per million)	EF (lb/hr)	Size (hp)	Chronic Cancer Cases (per year)						PM Mortality						Weighted Average (by # of lb/hr	Capacity (based on the # of kW
								25 hours	50 hours	100 hours	250 hours	500 hours	1000 hours	25 hours	50 hours	100 hours	250 hours	500 hours	1000 hours		
0-100 kW	50	2,269	100	226,933	14.6	0.15	67	0.05	0.11	0.22	0.54	1.09	2.18	0.73	1.45	2.9	7.3	15	29	335	113,467
101-200 kW	150	2,269	100	226,933	14.6	0.44	201	0.16	0.33	0.65	1.63	3.27	6.54	2.18	4.35	8.7	21.8	44	87	1004	340,400
201-300 kW	250	2,269	100	226,933	14.6	0.74	335	0.27	0.54	1.09	2.72	5.45	10.90	3.63	7.26	15	36.3	73	145	1674	567,333
301-400	350	118	100	11,839	14.6	1.03	469	0.02	0.04	0.08	0.20	0.40	0.80	0.26	0.53	1.1	2.6	5	11	122	41,438
401-500	450	868	100	86,822	14.6	1.33	603	0.19	0.38	0.75	1.88	3.75	7.51	2.50	5.00	10	25.0	50	100	1153	390,700
501-600	550	688	100	68,764	14.6	1.62	738	0.18	0.36	0.73	1.82	3.63	7.27	2.42	4.84	10	24.2	48	97	1116	378,203
601-700	650	588	100	58,838	14.6	0.61	872	0.06	0.12	0.23	0.58	1.17	2.34	0.78	1.56	3	7.8	16	31	359	382,449
701-800	750	255	100	25,473	14.6	0.70	1,006	0.03	0.06	0.12	0.29	0.58	1.17	0.39	0.78	1.6	3.9	8	16	179	191,045
801-900	850	508	100	50,826	14.6	0.80	1,140	0.07	0.13	0.26	0.66	1.32	2.64	0.88	1.76	4	8.8	18	35	406	432,019
901-1000	950	184	100	18,417	14.6	0.89	1,274	0.03	0.05	0.11	0.27	0.53	1.07	0.36	0.71	1.4	3.6	7	14	164	174,960
1001-1100	1,050	255	100	25,473	14.6	0.99	1,408	0.04	0.08	0.16	0.41	0.82	1.63	0.54	1.09	2.2	5.4	11	22	251	267,463
1101-1200	1,150	161	100	16,145	14.6	1.08	1,542	0.03	0.06	0.11	0.28	0.57	1.13	0.38	0.76	1.5	3.8	8	15	174	185,663
1201-1300	1,250	73	100	7,295	14.6	1.17	1,676	0.01	0.03	0.06	0.14	0.28	0.56	0.19	0.37	0.7	1.9	4	7	86	91,187
1301-1400	1,350	159	100	15,905	14.6	1.27	1,810	0.03	0.07	0.13	0.33	0.66	1.31	0.44	0.87	1.7	4.4	9	17	202	214,724
1401-1500	1,450	37	100	3,707	14.6	1.36	1,944	0.01	0.02	0.03	0.08	0.16	0.33	0.11	0.22	0.4	1.1	2	4	50	53,756
1501-1600	1,550	260	100	25,951	14.6	1.45	2,079	0.06	0.12	0.25	0.61	1.23	2.46	0.82	1.64	3	8.2	16	33	378	402,241
1601-1700	1,650	44	100	4,425	14.6	1.55	2,213	0.01	0.02	0.04	0.11	0.22	0.45	0.15	0.30	0.6	1.5	3	6	69	73,010
1701-1800	1,750	39	100	3,946	14.6	1.64	2,347	0.01	0.02	0.04	0.11	0.21	0.42	0.14	0.28	0.6	1.4	3	6	65	69,063
1801-1900	1,850	28	100	2,751	14.6	1.74	2,481	0.01	0.02	0.03	0.08	0.16	0.31	0.10	0.21	0.4	1.0	2	4	48	50,886
1901-2000	1,950	74	100	7,415	14.6	1.83	2,615	0.02	0.04	0.09	0.22	0.44	0.88	0.29	0.59	1.2	2.9	6	12	136	144,584
2001-2100	2,050	164	100	16,384	14.6	1.92	2,749	0.05	0.10	0.21	0.51	1.03	2.05	0.68	1.37	2.7	6.8	14	27	315	335,868
more	2,150	32	100	3,229	14.6	2.02	2,883	0.01	0.02	0.04	0.11	0.21	0.42	0.14	0.28	0.6	1.4	3	6	65	69,422
Total		**11,344**	**100**	**1,134,404**		**26.3**		**1.4**	**2.7**	**5.4**	**14**	**27**	**54**	**18**	**36**	**72**	**181**	**362**	**724**	**8,349**	**4,969,880**

Total generating capacity	**4,970**	**MW**
Total number of BUGs	**11,344**	**-**
Average BUG size	**438**	**kW**
Average BUG size	**587**	**hp**
Weighted average emission factor	**0.74**	**lb/hr**
Weighted average emission factor	**0.00125**	**lb/hp-hr**

Appendix 4-4: Intake Fraction, Permitted vs. Distributed Generation Use

Cancer cases per (run hr*IF*EF) 4.4E-07
Excess deaths per (run hr*IF*EF) 5.9E-06

Number of BUGs in State	Percent Running as DG	Run hours for running as DG	Percent Running as Permitted	Run hours for running as permitted	Average Run Hours	Total Run Hours	IF (per million)	EF (lb/hr)	Chronic Cancer Cases (per year)	PM Mortality (per year)
11,344	0%	1,000	100%	100	100	1,134,400	14.6	0.74	5	72
11,344	10%	1,000	90%	100	190	2,155,360	14.6	0.74	10	138
11,344	20%	1,000	80%	100	280	3,176,320	14.6	0.74	15	203
11,344	30%	1,000	70%	100	370	4,197,280	14.6	0.74	20	268
11,344	40%	1,000	60%	100	460	5,218,240	14.6	0.74	25	333
11,344	50%	1,000	50%	100	550	6,239,200	14.6	0.74	30	398
11,344	60%	1,000	40%	100	640	7,260,160	14.6	0.74	35	463
11,344	70%	1,000	30%	100	730	8,281,120	14.6	0.74	40	528
11,344	80%	1,000	20%	100	820	9,302,080	14.6	0.74	45	594
11,344	90%	1,000	10%	100	910	10,323,040	14.6	0.74	49	659
11,344	100%	1,000	0%	100	1000	11,344,000	14.6	0.74	54	724

Appendix 4-5: Diesel PM Intake Fractions by Air Basin

2001 California Almanac of Emissions and Air Quality (page 355)
Annual Average Concentrations and Health Risks
http://www.arb.ca.gov/aqd/almanac/almanac01/almanac01.htm

Intake Fraction based on comparison of concentration for 2000 with emissions for 2000.
Note that for Diesel Particulate Matter (DPM), concentration estimates are based on receptor modeling techniques. As is pointed out in the Almanac, DPM concentrations for 2000 are listed under the year 1999.

		South Coast Air Basin	San Francisco Bay Air Basin	San Diego Air Basin	Sacramento Metro Air Basin	San Joaquin Valley Air Basin	Other (*)
Population		14,930,000	6,759,100	2,943,000	2,344,600	3,252,300	-
Breathing rate	m^3/d	12	12	12	12	12	-
Concentration in 2000 (listed as 1999 in the Almanac)	µg/m^3	2.40	1.60	1.40	1.20	1.30	-
Concentration in 2000 (listed as 1999 in the Almanac)	g/m^3	2.40E-06	1.60E-06	1.40E-06	1.20E-06	1.30E-06	-
Emissions	tons/year	8024	4221	1748	2251	4139	-
Emissions	grams/day	19,961,074	10,500,460	4,348,449	5,599,748	10,296,471	-
Intake Fraction	-	2.15E-05	1.24E-05	1.14E-05	6.03E-06	4.93E-06	5.00E-06
Intake Fraction	per million	21.5	12.4	11.4	6.0	4.9	5.0
Intake Fraction	%	0.0022%	0.0012%	0.0011%	0.0006%	0.0005%	0.0005%
Number of BUGs in District		5350	2021	877	548	964	1584
Intake Fraction times the number of BUGs in District		115,245	24,977	9,972	3,304	4,750	7,920

Average Intake Fraction weighted by # BUGs in District	per million	**14.65**

* "Other" are the BUGs that are located somewhere other than in the five air basins listed here. These BUGs only represent a small fraction (14%) of the total number of BUGs, and they are not expected to contribute significantly to the total state-wide intake. For this analysis, we assumed an intake fraction of 5 per million in these "other" locations, based on the intake fraction value for the San Joaquin Valley Air Basin. If we had assumed an intake fraction of zero rather than 5 per million, the estimated state-wide average intake fraction would decrease by 5%, from 14.6 per million to 13.9 per million.

$$\text{Intake Fraction} = \frac{\text{population x breathing rate (m^3 / day) x concentration (g/m^3)}}{\text{emissions (g/day)}}$$