Appendix VII

Risk Characterization Scenarios

October 2000

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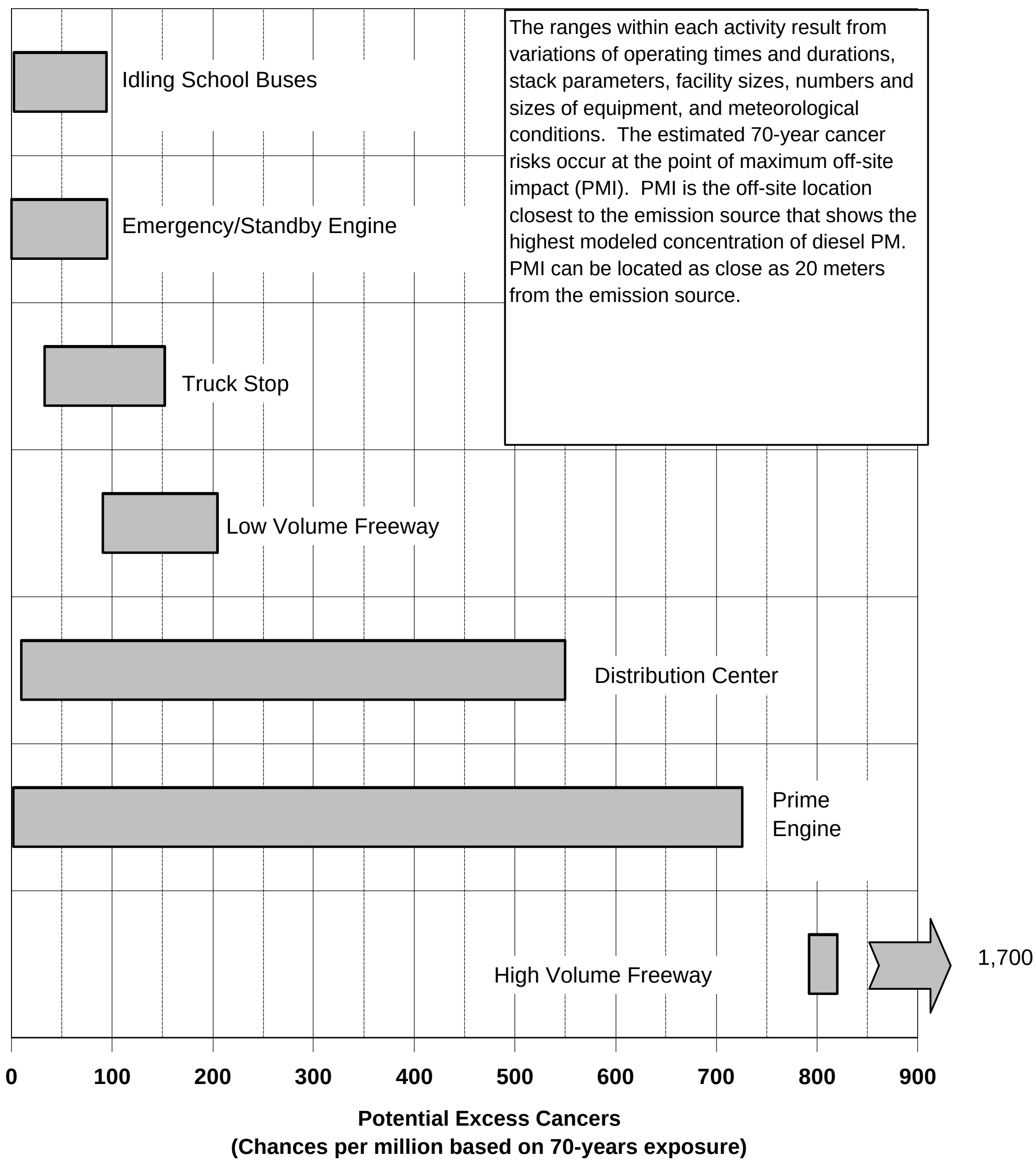
I. INTRODUCTION

The purpose of the risk characterization scenarios is to estimate, through air dispersion modeling, the 70-year cancer risk associated with typical diesel-fueled engine or vehicle activities. The risk assessment methodologies followed by ARB staff in preparing the risk characterization scenarios are consistent with the California Air Pollution Control officers Association (CAPCOA) “Hot Spots” Program Revised 1992 Risk Assessment Guidelines, October 1993.

Figure 1: Potential Cancer Risk Range of Activities Using Diesel-Fueled Engines



The estimated risks presented in Figure 1, and the assumptions used to determine these risks, are not based on a specific source of diesel PM. Instead, general assumptions bracketing a fairly broad range of possible operating scenarios were used. The estimated risks are based on the diesel PM concentration at the point of maximum impact as determined using air dispersion modeling. The estimated risk ranges are used to provide a "qualitative" assessment of potential risk levels near sources of diesel PM. These estimates are based on the risk assessment methodology and assumptions identified below. Actual risk levels from these types of sources at any individual site will vary due to site specific parameters, including equipment technologies and emission rates, fuel properties, operating schedules, meteorology, and the actual location of off-site receptors.

We have chosen seven different operations or activities based on their prevalence throughout California, and their potential to increase Californians' exposure to diesel particulate matter (PM). These include idling school buses, truck stops, low volume freeways, high volume freeways, emergency/standby engines, prime engines, and distribution centers. Figure 1 shows the range of 70-year cancer risks associated with each of the seven scenarios. We chose the off-site point of maximum impact (PMI) as the location where our estimated 70-year potential cancer risks occur. PMI can be characterized as the off-site location closest to the emissions source that shows the highest modeled concentration of diesel PM.

Meteorological data are a site-specific parameter that is input to the air dispersion model to calculate concentrations and subsequent risk. It is important to indicate its variability in our analysis. For this initial effort, meteorological variability is addressed by performing the air dispersion modeling analysis with data from Anaheim and Concord. We recognize that there are over one hundred possible sources for meteorological data in California and more work may need to be performed to more completely determine the meteorological variability throughout California. However, we do not expect further refinements to significantly change our conclusions.

The modeling results of the completed scenarios are characterized as estimates of potential excess cancer risks in chances per million per microgram of diesel PM in a cubic meter of air over a 70-year lifetime. The estimated 70-year potential cancer risks in Figure 1 are based on the modeled diesel PM concentrations at the point of maximum impact (PMI). Potential cancer risk is calculated by multiplying the annual average concentration from inhalation exposure by the Unit Risk Factor (URF) for diesel PM (i.e., 300×10^{-6} $(\mu g/m^3)^{-1}$). We expect the potential cancer risks for the majority of these activities in California to fall within the ranges illustrated in Figure 1.

II. RISK CHARACTERIZATION SCENARIOS

In all but the freeway scenario, we used the Industrial Source Complex Short-Term (ISCST3) air dispersion model. In the freeway scenario, the California Line Source Dispersion (CALINE4) Model was used. The range of estimated 70-year cancer risks depicted in Figure 1 are considered to occur at the point of maximum offsite impact. PMI is the off-site location closest to the emission source that shows the highest modeled concentration of diesel PM. The PMI can be located as close as 20 meters from the emission point.

A. Idling School Buses

In this scenario, we evaluated diesel PM emissions resulting from the loading and unloading of school children in the designated loading zone. We modeled idling and running diesel PM emissions (both entering and leaving the loading zone) that only occurred in the designated loading zone. We assumed the buses were moving for 27 seconds per event, and we varied the idling times in each modeling run from two minutes to 15 minutes per bus. We assumed five, 78 passenger school buses (pre-1994 model years) delivered and picked-up students in a designated area at the school twice a day (i.e., between 8:00 a.m. - 9:00 a.m. and 2:00 p.m. - 3:00 p.m.). Five buses idling for two minutes per event represent the lower end of the risk range, and 20 buses idling for 15 minutes per event represent the upper end of the risk range. For more details, see Table 1.

B. Truck Stop

In this scenario, we evaluated the diesel PM emissions associated with a five-acre truck stop. We assumed an average of 5 diesel-fueled trucks per hour used this facility, 24 hours per day, 365 days per year. We assumed 10 percent of all the trucks have transport refrigeration units (TRUs) that cycle-on 10 percent of the time, while on-site. Cycling means the diesel engine of a TRU is running to achieve or maintain the temperature setting of the TRU. The temperature setting, and the allowable temperature range, is dependent on the product being transported. We increased the number of trucks and the size of the truck stop to 25 per hour in the 25-acre truck stop. The five-acre truck stop represents the lower end of the risk range, and the 25-acre truck stop represents the upper end of the risk range. Area one, the parking lot, is 30 percent of the entire surface area of the truck stop. Area two is the area around the diesel fuel pumps. The emissions generated in area two resulted from the refueling of trucks, and from the cycling of TRUs. For more details, see Table 2.

C. Low Volume Freeway

In this scenario, we evaluated diesel PM emissions resulting from heavy heavy-duty (HHD) diesel-fueled truck activity on a four-kilometer segment of freeway. A brief analysis of the composition of diesel-fueled vehicles on a freeway segment demonstrated that HHD diesel-fueled trucks predominated. The freeway has three lanes in each direction. Receptors were placed perpendicular to the freeway segment, and may be as close as 20 meters from the edge of the freeway. Sound walls and other obstructions were not considered in the evaluation. We modeled a truck traffic flow of 2,000 trucks per day.

Except for meteorological data, all inputs in our air dispersion modeling runs were the same (See Table 3). The low and high ends of the cancer risk range were generated as a result of the variability in Concord and Anaheim meteorological data. Concord meteorological data gave us the low end of the risk range, while Anaheim meteorological data gave us the high end of our risk range. For more details, see Table 3.

D. High Volume Freeway

This scenario is a similar approach to the low volume freeway scenario except a HHD diesel-fueled truck traffic flow of 20,000 trucks per day. The low and high ends of the cancer risk range were also generated as a result of the variability in Concord and Anaheim meteorological data, respectively. For more details, see Table 4.

E. Emergency/Standby Diesel Engines

In this scenario, we evaluated diesel PM emissions resulting from intermittent maintenance operations of emergency or standby diesel-fueled engines. We chose a 306 hp engine and a 1,109 HP engine, due to availability of PM emissions data at various loads. Based on data from operators of emergency standby engines, the engines were assumed to operate 12 to 100 hours per year from 10 to 100 percent load. A ISO 8178 composite diesel PM emission factor of 0.1 grams per brake horsepower-hour (g/bhp-hr) was used to represent the newest engines available, while a ISO 8178 composite diesel PM emission factor of 1.0 grams per brake horsepower-hour was used to represent the oldest existing engines.

To generate the low end of the cancer risk range, we used a 1,109 HP engine operating at 100% load for 12 hours per year with an emission factor of 0.0757 g/bhp-hr. Data provided by industry show engines operating at 100 percent load emit a slightly lower amount of diesel PM emissions on a g/bhp-hr basis. The ARB staff adjusted the ISO 8178 composite emission factor to account for this decrease in emissions. The high load and increased horsepower of the larger engine increase dispersion because of the higher exhaust temperature and flowrate, thereby decreasing the maximum risk of cancer. The lesser amount of time for the release also contributes to decreasing the maximum risk of cancer. We assumed the diesel PM emissions were released at the time of day with the best dispersion conditions (6:00 a.m.) using Concord meteorological data.

The high end of the cancer risk range was determined using a 306 HP engine operating at 10 percent load for 100 hours per year with an emission factor of 2.78173 g/bhp-hr. Data provided by industry show engines operating at 10 percent load emit a significantly larger amount of diesel PM emissions on a g/bhp-hr basis. The ARB staff adjusted the ISO 8178 composite emission factor to account for this increase in emissions. The low load and decreased horsepower of the smaller engine decrease dispersion because of the lower exhaust temperature and flowrate, thereby increasing the maximum risk of cancer. The greater amount of time for the release also contributes to increasing the maximum risk of cancer.

In addition to increased diesel PM emissions, the diesel PM emissions were modeled as if released during the time of the day with the worst dispersion conditions (3:00 p.m.) using Anaheim meteorological data. For more details, see Table 5.

F. Prime Engines

In this scenario, we evaluated diesel PM emissions from prime engines. Prime engines are used in a variety of applications, e.g., compressors, cranes, generators, pumps (including agricultural pumps), grinders, or screening units. Engines used in agricultural irrigation operations represent about two-thirds of the engines in prime applications. The size and operation of prime engines are highly variable, depending on the specific operation. Data provided by local air districts showed that high use engines have a wide range of horsepower ratings. We chose a 420 HP engine and a 1490 HP engine to generate, respectively, the high and low ends of the cancer risk range. We chose these engines due to availability of engine operating parameters at various loads.

To generate the lower end of the potential cancer risk range at the point of maximum impact, we used a 1,490 HP engine operating at 100% load for 100 hours per year with an emission factor of 0.1 g/bhp-hr. The high load and increased horsepower of the larger engine increase dispersion because of the higher exhaust temperature, thereby decreasing the maximum risk of cancer. The lesser amount of time for the release also contributes to decreasing the maximum risk of cancer. We assumed the diesel PM emissions were released at the time of day with the best dispersion conditions (6:00 a.m.) using Concord meteorological data.

To generate the higher end of the potential cancer risk range at the point of maximum impact, we used a 420 HP engine operating at 80 percent load for 2,080 hours per year with an emission factor of 1.0 g/bhp-hr. The lower load and decreased horsepower of the smaller engine decrease dispersion because of the lower exhaust temperature, thereby increasing the maximum risk of cancer. Decreasing the load to 10 percent was not practical for simulating an engine working for a lengthy amount of time. The greater amount of time for the release also contributes to increasing the maximum risk of cancer. We modeled the diesel PM emission as if they were released during the time of the day with the worst dispersion conditions (12:00 p.m. to 5:00 p.m.) using Anaheim meteorological data. For more details, see Table 6. The stack diameters for the low and high end risk ranges were taken from the table found in U.S. EPA guidance listed in 40 CFR PART 86.884-8 (c)(4).

G. Distribution Center

In this scenario, we evaluated diesel PM emissions associated with the shipping and receiving of goods at a distribution center. We modeled two facilities to create a range of risks. The following operating parameters occurred at both facilities: We assumed that the HHD diesel-fueled trucks idled for one minute at the refueling station (area 1), and the trucks idled for five minutes in the shipping or receiving areas (areas 2, 3, and 4). Area 5 is the facility, and the emissions rate specified in Table 7 represents traveling over this route. We also assumed the TRU's diesel-fueled engines run for 60 minutes to reach the desired temperature for the product being shipped.

To generate the low end of the cancer risk range, we modeled the diesel-emitting activities associated with the shipping and receiving of goods from 200 HHD diesel-fueled trucks. We assumed this distribution center did not use TRU's. We also assumed only 100 of the trucks refueled on-site every day.

To generate the high end of the cancer risk range, we modeled the diesel-emitting activities associated with the shipping and receiving of goods from 700 HHD diesel-fueled trucks (400 of the trucks have TRUs). We assumed all of the trucks refueled on-site every day. In addition to the time needed for a TRU to reach the desired temperature, we assumed the TRUs cycled 25 percent of the time for two hours (i.e., 15 minutes every hour for two hours). All diesel-emitting activities mentioned above occur over a 24-hour period. The distribution center operates 24 hours per day, 365 days per year. For more details, see Table 7.

III. CONCLUSIONS

While our risk characterization scenarios are hypothetical by design, we believe they represent the range of potential cancer risks that could occur at such an activity in California. Keep in mind that the potential ranges of risks characterized in the scenarios occur at the PMI, which is the off-site location closest to the emission source that shows the highest modeled concentration. We assumed in all the scenarios that a residence is located at the PMI, and the PMI can be located as close as 20 meters from the emission source. We conclude from the results of our analyses that all categories of diesel-fueled engines or vehicles may need to further reduce their emissions of diesel PM to adequately protect the health of all Californians.

However, many factors greatly influence the determination of whether a diesel PM emitting activity or operation poses a significant health risk, such as the size of an operation, the frequency of the activity, the age of the vehicles or engines, and the location of the sensitive receptors in relation to the diesel PM emitting sources. Other critical factors are the air dispersion model used to characterize the risk, emission factors, meteorological data, and modeling configuration such as area source, point source, and volume source. Because of these uncertainties, it must be recognized that the most accurate estimate of potential cancer risk of any diesel PM operation or activity should be based on site-specific information and meteorology.

<table>
<tr><th colspan="5">Table 1: Idling School Buses Scenario</th></tr>
<tr><th>Equipment Parameter</th><th colspan="2">Low Risk</th><th colspan="2">High Risk</th></tr>
<tr><td>School Bus Throughput</td><td colspan="2">5 buses</td><td colspan="2">20 buses</td></tr>
<tr><td>Idling Emission Factor Per Bus[a]</td><td colspan="4">2.52 g/hour</td></tr>
<tr><td>Running Emission Factor[b]</td><td colspan="4">0.67 g/mile</td></tr>
<tr><td>Stack Temperature</td><td colspan="4">366 K</td></tr>
<tr><td>Stack Height</td><td colspan="4">0.6 meters</td></tr>
<tr><td>Stack Diameter</td><td colspan="4">0.1 meters</td></tr>
<tr><td>Stack Exit Velocity</td><td colspan="4">0.01 m/sec</td></tr>
<tr><td colspan="5"></td></tr>
<tr><th>Activity</th><th colspan="2">Low Risk</th><th colspan="2">High Risk</th></tr>
<tr><td>Idling Time Per School Bus.</td><td colspan="2">2 minutes, twice a day, 180 days per year</td><td colspan="2">15 minutes, twice a day, 180 days per year</td></tr>
<tr><td>Traveling Distance Per School Bus.</td><td colspan="2">60 meters</td><td colspan="2">60 meters</td></tr>
<tr><td colspan="5"></td></tr>
<tr><th rowspan="2">ISCST3 Input Parameters</th><th colspan="2">Low Risk</th><th colspan="2">High Risk</th></tr>
<tr><th>Idle</th><th>Moving</th><th>Idle</th><th>Moving</th></tr>
<tr><td>Source Type</td><td>Point Source</td><td>Area Source 60 m x 6.6 m</td><td colspan="2" rowspan="10">Staff assumed the cancer risk would be linear, with 20 buses in intervals of 5 buses with each bus idling 15 minutes. Therefore, staff multiplied the low end of the risk range by 4 to account for 20 buses, and then multiplied by 7.5 to account for 15 minutes of idling time.</td></tr>
<tr><td>Emission Rate</td><td>0.0007 g/s</td><td>1.175×10^{-5} g/s-m^2</td></tr>
<tr><td>Hourly Scalar Factor</td><td>0.01644</td><td>0.003678</td></tr>
<tr><td>Model Option</td><td colspan="2">Rural</td></tr>
<tr><td>Time Emissions Are Being Emitted</td><td colspan="2">8 a.m. & 2 p.m.</td></tr>
<tr><td>Flagpole Height</td><td colspan="2">1.2 meters</td></tr>
<tr><td>Release Height</td><td colspan="2">0.6 meters</td></tr>
<tr><td>F_{z0}</td><td>NA</td><td>1.39</td></tr>
<tr><td>Stack Velocity</td><td>0.01 m/sec</td><td>NA</td></tr>
<tr><td>Stack Temperature</td><td>366 K</td><td>NA</td></tr>
<tr><td>MET Data</td><td colspan="2">Anaheim</td><td colspan="2">Concord</td></tr>
<tr><td>Closest Receptor Location</td><td colspan="2">20 m from source center</td><td colspan="2">20 m from source center</td></tr>
</table>

a. United States Environmental Protection Agency, Air and Radiation, Office of Mobile Sources, Emission Facts, April 1998, "Idling Vehicle Emissions" EPA420-F98-014.

b. California Air Resources Board, "Methodology For Estimating Emissions From On-Road Motor Vehicles" Volume II: EMFAC 7G, November 1996.

c. 0.01644 prorates from 1-hour to 2 minutes and 365 days to 180 days.

d. 0.003678 assumes the buses travel the 60 meters at 5 miles/hour and prorates 365 days to 180 days

<table>
<tr><th colspan="7">Table 2: Truck Stop Scenario</th></tr>
<tr><th colspan="3">Equipment Parameter</th><th colspan="2">Low Risk</th><th colspan="2">High Risk</th></tr>
<tr><td colspan="3">Truck Throughput</td><td colspan="2">5 trucks/hour (5-acre)</td><td colspan="2">25 trucks/hour (25-acre)</td></tr>
<tr><td colspan="3">Idling Emission Factor Per Truck[a]</td><td colspan="4">2.57 g/hour</td></tr>
<tr><td colspan="3">Running Emission Factor[b]</td><td colspan="4">0.67 g/mile</td></tr>
<tr><td colspan="3">50 HP TRU Emission Factor[c]</td><td colspan="4">0.76 g/bhp-hr</td></tr>
<tr><td colspan="3">50 HP TRU Load Factor[c]</td><td colspan="4">0.28</td></tr>
<tr><td colspan="3">TRU Emission Rate (35 HP)</td><td colspan="4">0.0021 g/sec</td></tr>
<tr><th colspan="3">Activity</th><th colspan="2">Low Risk</th><th colspan="2">High Risk</th></tr>
<tr><th colspan="2">Area 1</th><th>Area 2</th><th>Area 1</th><th>Area 2</th><th>Area 1</th><th>Area 2</th></tr>
<tr><td>Idling time</td><td rowspan="3">10 percent of all trucks</td><td>N/A</td><td>6 mins/hr</td><td>N/A</td><td>6 mins/hr</td><td>N/A</td></tr>
<tr><td>Travel distance</td><td rowspan="2">90 percent of all trucks</td><td>0.248 mi</td><td>0.124 mi</td><td>0.622 mi</td><td>0.311 mi</td></tr>
<tr><td>TRU cycling</td><td>6 mins/hr</td><td>1 min/hr</td><td>6 mins/hr</td><td>1 min/hr</td></tr>
<tr><td colspan="7">24 hours/day, 365 days/year</td></tr>
<tr><th colspan="3" rowspan="2">ISCST3 Input Parameters</th><th colspan="2">Low Risk</th><th colspan="2">High Risk</th></tr>
<tr><th>Area 1</th><th>Area 2</th><th>Area 1</th><th>Area 2</th></tr>
<tr><td colspan="3">Source Type</td><td colspan="2">Area Source</td><td colspan="2">Area Source</td></tr>
<tr><td colspan="3">Area Source Dimensions (meters)</td><td>39.6 x 132</td><td>92.4 x 132</td><td>92.4 x 308</td><td>215.6 x 308</td></tr>
<tr><td colspan="3">Emission Rate (g/s/m^2)</td><td>2.54E-8</td><td>7.74E-8</td><td>5.39E-8</td><td>7.37E-8</td></tr>
<tr><td colspan="3">Model Option</td><td colspan="2">Rural</td><td colspan="2">Rural</td></tr>
<tr><td colspan="3">Time Emissions Are Being Emitted</td><td colspan="2">24 hours/day</td><td colspan="2">24 hours/day</td></tr>
<tr><td colspan="3">Flagpole Height</td><td colspan="2">1.5 meters</td><td colspan="2">1.5 meters</td></tr>
<tr><td colspan="3">Release Height</td><td colspan="2">4.15 meters</td><td colspan="2">4.15 meters</td></tr>
<tr><td colspan="3">F_{z0}</td><td colspan="2">1.39</td><td colspan="2">1.39</td></tr>
<tr><td colspan="3">MET Data</td><td colspan="2">Anaheim</td><td colspan="2">Anaheim</td></tr>
<tr><td colspan="3">Closest Receptor Location</td><td colspan="2">20 m from fence line</td><td colspan="2">20 m from fence line</td></tr>
</table>

a. United States Environmental Protection Agency, Air and Radiation, Office of Mobile Sources, Emission Facts, April 1998, "Idling Vehicle Emissions" EPA420-F98-014.

b. California Air Resources Board, "Methodology For Estimating Emissions From On-Road Motor Vehicles" Volume II: EMFAC 7G, November 1996.

c. California Air Resources Board, "California's Emissions Inventory of Off-Road Large Compression-Ignited Engines ($\geq$ 25 hp) Using the New OFFROAD Emissions Model," January 2000

Table 3: Low Volume Freeway Scenario		
Equipment Parameter	**Low Risk**	**High Risk**
Freeway Throughput	2,000 trucks per day (low volume freeway)	
Running Emission Factor[a]	0.67 g/mile	
Activity	**Low Risk**	**High Risk**
Diurnal Variation	Peak Hours 8am – 3pm Off-Peak Hours 10pm – 3am Off-Peak Throughput Approximately 10 percent of Peak Throughput Daily, 365 days per year	
Freeway segment analyzed .	4 kilometers segment length, 3 lanes in each direction	
CALINE-4 Additional Parameters	**Low Risk**	**High Risk**
Line Source	4,000 meters length by four links spaced 3.66 meters apart with center median. (0.0, 0.3, 0.7 of flow in lanes number one, two, and three, respectively)	
Flagpole Height	1.5 m	
F_{z0}	Links normally 9.66 m wide are assigned widths of 11.7 m to account for initial dispersion of a truck compared to an automobile.	
Meteorological Data	Concord	Anaheim
Closest Receptor Location	20 m from edge of freeway	

a. California Air Resources Board, "Methodology For Estimating Emissions From On-Road Motor Vehicles" Volume II: EMFAC 7G, November 1996.

Table 4: High Volume Freeway Scenario		
Equipment Parameter	**Low Risk**	**High Risk**
Freeway Throughput	20,000 trucks per day (high volume freeway)	
Running Emission Factor[a]	0.67 g/mile	
Activity	**Low Risk**	**High Risk**
Diurnal Variation	Peak Hours 8 a.m. – 3 p.m. Off-Peak Hours 10 p.m. – 3 a.m. Off-Peak Throughput Approximately 10 percent of Peak Throughput Daily, 365 days per year	
Freeway segment analyzed .	4 kilometers segment length, 3 lanes in each direction	
CALINE-4 Additional Parameters	**Low Risk**	**High Risk**
Line Source	4,000 meters length by four links spaced 3.66 meters apart with center median. (0.0, 0.3, 0.7 of flow in lanes number one, two, and three, respectively)	
Flagpole Height	1.5 m	
F_{z0}	Links normally 9.66 m wide are assigned widths of 11.7 m to account for initial dispersion of a truck compared to an automobile.	
Meteorological Data	Concord	Anaheim
Closest Receptor Location	20 m from edge of freeway	

a. California Air Resources Board, "Methodology For Estimating Emissions From On-Road Motor Vehicles" Volume II: EMFAC 7G, November 1996.

Table 5: Emergency Standby Engine Scenario		
Engine Operating Parameter	**Low Risk**	**High Risk**
Maximum Engine Rating	1,109 HP (1,109 at 100 percent load)	306 HP (40.4 at 10 percent load)
ISO 8178 Composite Emission Factor	0.1 g/bhp-hr	1.0 g/bhp-hr
Emission Factor	0.075713 g/bhp-hr	2.78173 g/bhp-hr
Load	100 percent	10 percent
Emission Rate	0.02332 g/sec	0.031217 g/sec
Stack Temperature	787 K	536 K
Stack Height	3 m	3 m
Stack Diameter	0.254 m	0.127 m
Stack Exit Velocity	59.8 m/sec	19.5 m/sec
Note: Engine operating parameters based on engine specification sheets provided by engine manufacturers.		
Activity	**Low Risk**	**High Risk**
Emergency Standby Diesel Engine	A 1,109 HP engine running 0.0329 hours/day x 365 days/year = 12 hours/year	A 306 HP engine running 0.274 hours/day x 365 days/year = 100 hours/year
ISCST3 Input Parameters	**Low Risk**	**High Risk**
Source Type	Point Source	Point Source
MET Data	Concord	Anaheim
Model Option	Urban	Urban
Time Emissions Emitted	6 a.m.	3 p.m.
Flagpole Height	1.5 m	1.5 m
Release Height	Same as stack height	Same as stack height
Closest Receptor Location	20 m	20 m

Table 6: Prime Engine Scenario		
Engine Operating Parameter	**Low Risk**	**High Risk**
Maximum Engine Rating	1,490 HP	420 HP
Emission Factor	0.1 g/bhp-hr*	1.0 g/bhp-hr**
Load	100 percent	80 percent
Emission Rate	0.04139 g/sec	0.0933 g/sec
Stack Temperature	769 K	739 K
Stack Height	3 m	3 m
Stack Diameter	0.330 m	0.127 m
Stack Exit Velocity	45.4 m/sec	90.8 m/sec
* Current on-road heavy-duty certification standard. ** United States Environmental Protection Agency, Air and Radiation, Office of Air Quality Planning & Standards, Emission Facts, April 1998, "Compilation of Air Pollutant Emission Factors AP-42, Fifth Edition, Volume I: Stationary Point and Area Sources, Chapter 3, Section 3.3 Gasoline and Diesel Industrial Engines" EPA68-D2-0160. Note: Engine operating parameters based on engine specification sheets provided by engine manufacturers.		
Activity	**Low Risk**	**High Risk**
Prime Diesel Engine	A 1,490 HP engine running 0.274 hour/day x 365 days/year = 100 hours/year.	A 420 HP engine running 0.95 of 6 hours/day x 365 days/year = 2,080 hours/year.
ISCST3 Input Parameters	**Low Risk**	**High Risk**
Source Type	Point Source	Point Source
MET Data	Concord	Anaheim
Model Option	Urban	Urban
Time Emissions Emitted	6 a.m.	Noon - 5 p.m.
Flagpole Height	1.5 m	1.5 m
Release Height	Same as stack height	Same as stack height
Closest Receptor Location	20 m	20 m

<table>
<tr><th colspan="6">Table 7: Distribution Center Scenario</th></tr>
<tr><th colspan="2">Equipment Parameter</th><th colspan="2">Low Risk</th><th colspan="2">High Risk</th></tr>
<tr><td colspan="2">Trucks and transportation refrigeration units (TRUs)</td><td colspan="2">200 trucks no TRUs</td><td colspan="2">700 trucks and 400 TRUs</td></tr>
<tr><td colspan="2">Idling Emission Factor Per Truck[a]</td><td colspan="4">2.57 g/hour</td></tr>
<tr><td colspan="2">Running Emission Factor[b]</td><td colspan="4">0.67 g/mile</td></tr>
<tr><td colspan="2">50 HP TRU Emission Factor[c]</td><td colspan="4">0.76 g/bhp-hr</td></tr>
<tr><td colspan="2">50 HP TRU Load Factor[c]</td><td colspan="4">0.28</td></tr>
<tr><td colspan="2">TRU Emission Rate (34.8 HP)</td><td colspan="4">0.0021 g/sec</td></tr>
<tr><th colspan="2">Activity</th><th>Low Risk Number of Trucks</th><th>High Risk Number of Trucks/TRUs</th><th>Low Risk</th><th>High Risk</th></tr>
<tr><td rowspan="3">Area 1</td><td>Trucks, idling time per truck</td><td>200</td><td>700</td><td colspan="2">1 min/day</td></tr>
<tr><td>Traveling distance for trucks</td><td>N/A</td><td>N/A</td><td>N/A</td><td>N/A</td></tr>
<tr><td>TRUs, cooling and cycling time</td><td>N/A</td><td>400</td><td>N/A</td><td>N/A</td></tr>
<tr><td rowspan="3">Area 2
&
Area 3</td><td>Trucks, idling time per truck</td><td>75</td><td>250</td><td colspan="2">5 mins/truck</td></tr>
<tr><td>Traveling distance per truck</td><td colspan="2">N/A</td><td colspan="2">N/A</td></tr>
<tr><td>TRUs, cooling and cycling time per TRU</td><td>N/A</td><td>150, 150</td><td>60 mins, 6 mins/hr for 2 hrs</td><td>60 mins, 15 mins/hr for 2 hrs</td></tr>
<tr><td rowspan="3">Area 4</td><td>Trucks, idling time per truck</td><td>50</td><td>200</td><td colspan="2">5 mins/truck</td></tr>
<tr><td>Traveling distance per truck</td><td colspan="2">N/A</td><td colspan="2">N/A</td></tr>
<tr><td>TRUs, cooling and cycling time per TRU</td><td>N/A</td><td>100</td><td>60 mins, 6 mins/hr for 2 hrs</td><td>60 mins, 15 mins/hr for 2 hrs</td></tr>
<tr><td>Area 5</td><td>Traveling distance per Truck</td><td>200</td><td>700</td><td>0.44 mi/day</td><td>0.88 mi/day</td></tr>
<tr><td colspan="6">24 hours/day, 365 days/year</td></tr>
</table>

Table 7: Distribution Center Scenario (Cont.)								
ISCST3 Input Parameters	**Low Risk**				**High Risk**			
	Area 1	**Area 2 & Area 3**	**Area 4**	**Area 5**	**Area 1**	**Area 2 & Area 3**	**Area 4**	**Area 5**
Source Type	Area Source				Area Source			
Area Source Dimensions (meters^2)	50x20= 1,000	250x20= 5,000	125x20= 2,500	350x240= 84,000	50x40= 2,000	250x25= 6,250	140x25= 3,500	500x350= 175,000
Emission Rate (g/s/m^2)								
Idling trucks	9.92×10^{-8}	3.72×10^{-8}	4.96×10^{-8}	N/A	1.74×10^{-7}	9.92×10^{-8}	1.42×10^{-7}	N/A
TRUs Cooling	N/A	N/A	N/A	N/A	N/A	2.06×10^{-6}	2.45×10^{-6}	N/A
TRUs Cycling	N/A	N/A	N/A	N/A	N/A	1.03×10^{-6}	1.22×10^{-6}	N/A
Total	9.92×10^{-8}	3.72×10^{-8}	4.96×10^{-8}	N/A	1.74×10^{-7}	3.18×10^{-6}	3.82×10^{-6}	N/A
Traveling only	N/A	N/A	N/A	8.12×10^{-9}	N/A	N/A	N/A	2.73×10^{-8}
Model Option	Urban				Urban			
Time Emissions Are Being Emitted	24 hours/day				24 hours/day			
Flagpole Height	1.5							
Release Height	4.15							
F_{z0}	1.93							
MET Data	Anaheim							
Closest Receptor Location	20 m from fence line				20 m from fence line			

a. United States Environmental Protection Agency, Air and Radiation, Office of Mobile Sources, Emission Facts, April 1998, "Idling Vehicle Emissions" EPA420-F98-014.

b. California Air Resources Board, "Methodology For Estimating Emissions From On-Road Motor Vehicles" Volume II: EMFAC 7G, November 1996.

c. California Air Resources Board, "California's Emissions Inventory of Off-Road Large Compression-Ignited Engines (≥ 25 hp) Using the New OFFROAD Emissions Model," January 2000