Southwest Region University Transportation Center

WORKZONE MOBILE SOURCE EMISSION PREDICTION

Pattabiraman Seshadri and Rob Harrison

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Southwest Region University Transportation Center Center for Transportation Research The University of Texas at Austin Austin, Texas 78712

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EXECUTIVE SUMMARY

Many of the nation's heavily traveled urban freeways are in the process of reconstruction or rehabilitation. These construction activities, requiring traffic to be funneled through roadway workzones, often impact the surrounding environment through their generation of excess vehicle emissions. This report describes an excess emissions prediction method, one that makes it possible for planners to compare different workzone traffic management strategies based on the predicted values.

The prediction method used relies on a newly developed computer model based on the original QUEWZ developed by C. L. Dudek and J. L. Memmott in 1984. Our revised version—dubbed QUEWZEE (because it adds *Energy* and *Emissions*)—is capable of predicting mobile source emissions at freeway workzones, given the characteristics of the workzone (such as configuration, schedules), the characteristics of traffic at the workzone (such as volume, percent trucks), and the emissions characteristics of vehicles in the area. The model gives the excess emission values for two vehicle types and three pollutant types.

The model can be used to compare the environmental impacts of various construction and traffic management strategies for the workzone. In addition, the results obtained from the model can be used to expedite construction, which in turn can help reduce air pollution. The magnitude of the emissions problem at workzones is illustrated using workzones at deficientbridge reconstruction sites in the United States.

As to its limitations, we should point out that the model as structured cannot take into account the diversion of traffic (away from the workzone) that results when drivers seek to avoid long queues (i.e., traffic that diverts to frontage roads or to other parallel routes). For this reason, the traffic volume passing through a workzone must be considered less than typical. Further research is needed to quantify the nature of this traffic diversion.

The lack of accurate, validated models that characterize modal emissions from vehicles was underscored throughout this study. But as new data and modal emission rate models become available, the QUEWZEE model can be easily updated to incorporate the new findings.



ABSTRACT

Traffic congestion that results from freeway reconstruction and rehabilitation work often leads to an increase in vehicle emissions within the construction workzone. In this report, the authors develop a methodology for calculating these excess emissions by modifying an established workzone user cost study. This methodology, presented in the form of a computer model, takes into account workzone configuration and traffic characteristics. Using the model, planners can compare different workzone strategies to identify the one that most effectively reduces vehicle emissions.

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We would like to cite the earlier research efforts of C. L. Dudek and J. L. Memmott, who first developed the basic QUEWZ model in 1984. Their contribution to the modeling of user costs through workzones in general forms the basis for this study.

We would also like to thank Hernán de Solminihac, who provided insight and assistance to the study while working on his doctoral dissertation (in which he modified QUEWZ to report energy consumption as an element of total vehicle operating costs).

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CHAPTER 1. INTRODUCTION

BACKGROUND

Air pollution, commonly referred to as "smog," is the contamination of the ambient air by chemical compounds or particulate solids in a concentration that adversely affects living organisms (Ref 1). The main air pollutants include:

- carbon monoxides (CO) a product of the incomplete burning of fuel;
- hydrocarbons (HC) from incompletely burned or evaporated gasoline or solvents;
- nitrogen oxides (NOx) products of high-compression internal combustion engines;
- sulfur oxides products of the burning of sulfur-rich fossil fuel; and
- soot-like particulates (mostly carbon particles).

These pollutant species are emitted by a variety of sources, including automobiles, industrial processes, power plants, solid waste disposal practices, and other stationary fuel combustion. As shown in Table 1.1, mobile sources, more specifically highway vehicles, generate more pollution than any other source. The problem is particularly severe on the west coast, where, for example, more than half of the air borne pollutants measured in the south coast basin of California is generated from the region's estimated 8 million automobiles (Ref 2).

Transportation planners estimate that, because the mobility needs of the U.S. population will continue to outgrow transportation system capabilities, traffic congestion will represent a perennial problem well into the next century. To again cite the California situation, average highway speeds there are expected to fall from 35 mph to 19 mph or less (assuming no changes in driver behavior or transportation policy) — a consequence of the 5 million new residents expected in that state by 2010 (Ref 4). And with this drop in average speed will come more congestion and higher pollution levels. (Interestingly, if the current level of daily vehicle miles traveled in the California region operated under consistent and free flowing speeds, mobile source emissions could be reduced by approximately 13 percent [Ref 5].)

As has been frequently noted, traffic congestion, along with its concomitant pollution, can have severe negative impacts on society: Traffic congestion can lead to substantial time losses and can limit worker productivity, while pollution can impair health and can increase environmental clean-up costs. These externalities (in economic terms) should be taken into account by policy makers and transportation planners whenever transportation system improvements are considered.

But in pursuing the ideal transportation system, planners have long recognized that trade offs are inevitable. Moreover, the complexity of the problem is such as requires the efforts of different agencies: While transportation officials look for ways to meet the mobility needs of a region's growing population, air quality officials search for ways to reduce auto emissions.

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Source		Pollu	tant (% of	total)	
	CO	HC	NOx	SO	Particulates
	84 1				
Mobile Sources:	72.5	33.3	47.8	4.1	18.0
Highway vehicles	63.0	26.7	38.7	2.2	14.0
Gasoline					
Cars	38.1	16.7	16.6	0.7	7.1
Light trucks	11.2	5.6	5.7	0.2	2.1
Heavy trucks	12.4	2.8	2.9	0.1	0.9
Motorcycles	0.3	0.4	*	0.0	0.1
Diesel					
Cars	*	*	0.1	*	0.3
Light trucks	*	*	*	*	0.1
Heavy trucks	0.9	1.2	13.3	1.2	4.2
Other transportation modes	9.5	6.6	9.1	1.8	3.3
Industrial Processes	6.5	39.2	3.0	14.5	31.7
Power Plants	0.4	0.0	30.8	66.9	13.2
Other Fuel Combustion	8.5	11.0	16.9	14.5	18.5
Solid Waste Disposal	2.9	3.3	0.5	0.0	5.3
Miscellaneous	9.2	13.2	1.0	0.0	13.2

TABLE 1.1. SOURCE AND PROPORTION OF U.S. AIR POLLUTANTS (1982)

*Less than 0.05% Source: Ref 3

In the face of this challenge, several wide-ranging policies are being considered by state agencies for improving air quality, mobility, or both. Although examples of such policies are briefly described here, a more detailed description can be found in the report by Cameron (Ref 5). These policies include:

- one-day restrictions whereby every private passenger vehicle will be prohibited from use one day of each work week;
- · use of clean fuels and low-emission vehicles;
- use of transportation supply management techniques (e.g., widening of freeways without reconstruction and implementing freeway incident management programs);

- use of transportation demand management techniques (e.g., ridesharing, public transit use, HOV lanes, park-and-ride facilities, and parking management);
- freeway and highway capacity expansions; and
- electrification of buses and transit expansion.

This report specifically focuses on a single policy alternative: freeway and highway capacity expansion. With many of the nation's major metropolitan areas reconstructing their heavily traveled urban freeways, highway planners are finding that such improvements have substantial direct *and* indirect costs. Apart from project costs, the indirect costs borne by the adjacent communities and the environment are likely to be great, with the high traffic volumes involved leading to increased congestion, delay, and to dangerous levels of mobile source pollution in the vicinity of the work zones.

As a way of solving the complex problem of managing such projects, and to help in the evaluation of alternative construction, work zone scheduling, traffic management, and public relations strategies, a systems approach has been suggested (Ref 6). Within such an approach, the ability to predict mobile source emissions resulting from the presence of a work zone on a freeway would be a useful tool in an assessment of alternative strategies, particularly in relation to their impact on the environment. The results derived from such a model can also be used in the environmental impact statements required of state agencies to support the choice of specific strategies proposed for a given project.

STUDY OBJECTIVES

The objectives of this study included the following:

- review and evaluate current techniques and models used for the prediction of mobile source emissions;
- develop a methodology for the quantification of mobile source emissions at work zones based on the above review;
- (3) validate the methodology and implement it as a computer model; and
- (4) illustrate the applications of the computer model to work zone problems.

STUDY SCOPE

The organization of this report follows closely the order in which each of the objectives were achieved. Chapter 2 contains a review of some methodologies and models currently used for the estimation of mobile source emissions, while Chapter 3 discusses the methodology proposed for the prediction of work zone mobile source emissions. Chapter 4 describes the QUEWZ model (Ref 7) and its usefulness in the implementation of the methodology.

Chapter 5 presents the emission rate models that are to be used with the methodology. The computer model, along with sample results, is presented in Chapter 6. The application of the model in typical work zone problems is also illustrated.

Finally, Chapter 7 summarizes the results, provides some general conclusions, and makes recommendations for future research.

CHAPTER 2. LITERATURE REVIEW

This chapter reviews some of the methodologies and models currently used to predict mobile source emissions. The magnitude and complexity of the emission prediction problem is discussed first, followed by a description of the steps involved in the pollution modeling process. Further sections discuss (1) the testing procedures used to collect emissions data, (2) emission models developed by the Environmental Protection Agency (EPA) using the data, and (3) other models developed for specific applications. A thorough understanding of these methodologies and models will be helpful in modeling the emissions at a workzone, which is the subject of subsequent chapters.

BACKGROUND

A significant portion of the emissions in urban areas is generated by the automobile. These emissions can vary according to the type of engine, the mode of operation, the fuel composition, presence and working condition of emission control devices, atmospheric conditions, and engine tuning. As shown in Table 2.1, the effect of these variables differs from one pollutant to the other. These differences are summarized below (Ref 1):

- (1) Carbon Monoxide: As the air/fuel ratio increases (i.e., as the mix goes from "rich" to "lean"), the concentration of CO decreases rapidly (leaner mixes provide more complete combustion of the fuel). This implies that while idling and decelerating, the CO concentration is very high. It decreases during acceleration and high-speed cruising. Diesel engine CO emissions are very low for all modes of operation.
- (2) Hydrocarbons: HC emission is high for idling and deceleration, as opposed to cruising and acceleration. Cruising at high speeds results in a further reduction in HC emissions.
- (3) Nitrogen Oxides: NO_X emissions are the major contributors to photochemical smog ("Los Angeles type smog"). NO_X absorbs ultraviolet portions of the solar spectrum, an action that generates high oxidant concentrations. High levels of NO_X are produced during vehicle acceleration and high-speed cruising; lower concentrations exist during deceleration and idling, suggesting that these emissions are dependent on the temperature of combustion.
- (4) Particulates: Particulate emissions are comprised mainly of carbon particles, lead compounds, and motor oil. Particulate emission levels are significantly higher in diesel engines than in gasoline engines.

Emissions data required to model the above variations were collected from emissions testing programs applied to individual vehicles. The models, however, were designed to predict emissions from an aggregate fleet containing vehicles of various types, ages, and operating characteristics, and which operate under conditions that differ significantly from those of the test conditions. The manner in which such complexity has been dealt with in different models is discussed below.

Operating Mode or Engine Characteristics	Emission Concentration		
	CO	НС	ΝΟχ
ldle	High	High	Very low
Acceleration			
Moderate	Low	Low	High
Heavy	Moderate	High	Moderate
Deceleration	Very high	High	Very low
Cruise			
Low Speed	Low	Low	Low
High Speed	Very Low	Very Low	Moderate
Effect of cold engine	Higher	Higher	Lower
(warmup period)			
Effect of higher	Somewhat higher	Higher	Higher
compression ratio			
Effect of advancing	Higher for rich	Somewhat	Higher especially for
spark ignition	mixtures only	higher	lean mixtures
opart ignition	matures only	ingilei	
Effect of exhaust das	No effect	Higher	Considerably lower
recirculation			

TABLE 2.1. EMISSION CHARACTERISTICS WITH RESPECT TO OPERATING
MODE AND ENGINE CHARACTERISTICS

Source: Ref 8

MOBILE SOURCE POLLUTION MODELING

The modeling of mobile source pollution near a roadway consists of four main steps. The first step in the process involves the characterization of the traffic at the location where emissions are to be evaluated. Here we learn that the behavior of traffic varies according to the location being modeled. For example, if emissions from free flowing traffic on a highway are required, the key variable will be vehicle speeds and flow. To determine the source strength, one can use these speeds with an emission model that predicts the emissions of vehicles cruising at a given speed. On the other hand, if it is necessary to compute emissions at an intersection, then information may be required on traffic signal phasing, queue lengths, delay times, acceleration and deceleration rates, and capacity. (The traffic model required for the problem of workzone emission prediction will be the subject of the next chapter.)

The second step is the estimation of the source strength. This process is extremely difficult for mobile sources (as opposed to stationary sources) for the reasons stated in the previous section. It involves the use of an emissions model that accounts for vehicle conditions and driving patterns existing in the zone of interest. Most emission rate analysis models (both freeway and intersection air quality models) make use of the data from two major studies on mobile source emissions administered by the EPA. These models, along with their data requirements, are described in detail in the next section.

Using the emission profile outlined above, the third step models the dispersion of the emitted gases along and in the vicinity of the roadway. The dispersion of the emissions is dependent on such factors as source strength, width of roadway, wind direction and speed, source height, and mixing height. The most common dispersion model used for transportation applications is the gradient transport model.

The fourth step involves the calibration of the dispersion model using actual dispersion data collected from the location being modeled. All four steps involved in the mobile source pollution modeling process are illustrated in Figure 2.1.

The scope of this study is limited to the determination of the source strength of the emissions from traffic at a workzone. This can be used as the input for a dispersion model to predict the concentration of the pollutants at points away from the source. Hence, further discussions and analyses will be limited to topics related to emissions modeling. For a review of dispersion modeling techniques and some commonly used dispersion models, see Pasquill (Ref 9), CALINE4 (Ref 10), and HIWAY2 (Ref 11).

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EMISSIONS MODELING

As mentioned above, most emission rate analysis models (both freeway and intersection air quality models) make use of the data from two major studies on mobile source emissions administered by the EPA. The results of these studies were the Automobile Exhaust Emission Modal Analysis Model (Ref 12) and the MOBILE series of models (Refs 13-16). The development of these models involved collecting emissions data using (1) the Dynamometer Test Procedure for various vehicle categories and (2) standardized driving cycles to represent observed driving conditions.

Below, we discuss this test procedure and the two driving cycles used for model development by the EPA. Also discussed are the Modal Analysis Model and the MOBILE series of models. For specific applications, several models have been developed using a combination of these models, some of which will be discussed in the next section.

Dynamometer Test Procedure (Ref 17)

The first step in emission modeling involves measuring vehicle exhaust emissions—i.e., carbon monoxide, unburnt hydrocarbons and oxides of nitrogen. The exhaust gases are trapped and then analyzed to determine the concentrations of each component. The system for trapping

the emission is the Constant Volume Sampler System (CVS), which is defined as an SAE (Society of Automotive Engineers) recommended code of practice, and which is thus contained in the SAE Handbook (SAE J1094a). It is a complete vehicle test, one in which the wheels of the supported vehicle are positioned on the rolls of a chassis dynamometer. The rolls are connected to an absorption dynamometer and to large flywheels whose size is used to represent the inertia of the particular vehicle. The dynamometer is loaded in such a way as to simulate road travel, as defined by a prescribed driving cycle (see next section). A schematic of the test procedure is shown in Figure 2.2.

The whole of the exhaust is discharged into an airstream and conducted through a heat exchanger (which controls the temperature) to a "Constant Volume Sampler," which is an apparatus that measures a constant volume of gas for the total duration of the test. By measuring the concentration of each pollutant component in this total volume of gas collected, the mass of each component is ascertained. As the total time of the driving cycle is represented by a particular mileage, the result is expressed in g/mile or g/kilometer. To measure the concentration, a small sample is drawn off and collected in a plastic sampling bag for analysis.



Figure 2.2. Schematic arrangement of constant volume sampling systems (CVS) for gasoline vehicles (Ref 17).

Driving Cycles for Vehicle Emissions Data (Ref 18)

Vehicle emission rate models use data collected from dynamometer tests conducted on vehicles operating under standardized driving cycles. Two main types of driving cycles have been used in the emission rate models to be discussed later in this section. Both the testing programs use sequential bag sampling procedures to determine average exhaust emission rates for defined segments of the test cycle.

The main objective of the Surveillance Driving Sequence (SDS) testing program was the evaluation of emissions from on-road vehicles of various ages and maintenance conditions (Ref 12). The driving cycle consists of 37 segments, 16 of which are acceleration events, 16 deceleration events, a composite of all idle events, and 4 composite constant speed events at 15, 30, 45, and 60 mph. This driving cycle (Figure 2.3) uses relatively smooth patterns of acceleration and deceleration, with a low percentage of time spent in the idle mode (Table 2.2). Cruise events are defined as precisely constant speed operations. Vehicles tested are driven only in the hot stabilized engine condition. Dynamometer data are collected to represent average emission rates for each of the 37 segments of the cycle. Thus the results are aggregated and analyzed according to driving mode and speed.



Figure 2.3. SDS driving cycle speed profile (Ref 18).

The Federal Test Procedure (FTP) driving cycle testing program (Ref 19) is used (1) to certify that new vehicles meet federal emission standards and (2) to evaluate emissions from onroad vehicles. In contrast to the SDS driving cycle, the FTP driving cycle (Figure 2.4) provides a somewhat irregular sequence of accelerations and decelerations. The first 505 seconds of the FTP driving cycle is defined as the starting mode component of the test. The vehicle operates in the cold start mode in this segment. The remaining 867 seconds of operation is defined as the stable mode component, with the vehicle operating in the hot stabilized mode. The FTP driving cycle has very few periods of constant speed driving and twice the percentage of vehicle idling (Table 2.3) as the SDS cycle.

	SDS tes	st cycle
Driving Mode	seconds	percent
Idle	92	8.7
Acceleration	315	29.9
Cruise	363	34.4
Deceleration	284	26.9
Total	1054	100.0
Moon Spoods:		
Acceleration	25.4 mph	
Cruico	40.1 mph	
Cruise	40.1 mpn	
Deceleration	33.8 mpn	
Test Cycle Mean	33.8 mph	
Distance	9.89 miles	

TABLE 2.2. SDS DRIVING CYCLE CONDITIONS (REF 18)





The full FTP testing program repeats the start mode and stable mode driving sequences. The initial cycle is begun with a cold vehicle, running the start mode and stable mode driving sequences without interruption. The vehicle then sits for 10 minutes with the engine off before the driving cycle sequence is repeated. Emissions data are aggregated and analyzed by operating mode condition (cold start, hot start, and hot stabilized modes) rather than by driving mode.

^{>} test
percent
17.8
26.2
36.7
19.3
100.0

TABLE 2.3. FTP DRIVING CYCLE CONDITIONS (REF 18)

^{*}Cruise mode defined as either a nonzero speed unchanged from the previous second or an absolute speed change of less than 1 mph from that of the previous second while the cumulative 4-second sum of speed changes totals less than 2 mph.

Vehicle Emission Rate Models

The Environmental Protection Agency (EPA) has administered several exhaust emission studies that have resulted in the development of two distinct kinds of vehicle emission rate models: The Automobile Exhaust Modal Analysis Model and the MOBILE series of models. A brief discussion of these two models follows.

The Modal Analysis Model was developed to predict vehicle exhaust emissions over arbitrary driving sequences. By breaking the standard SDS cycle into segments or modes having specified speeds and accelerations, and noting the emissions produced in each segment, it was postulated that these segments could be recombined appropriately to form other driving sequences of interest. Based on this postulate, emission rate equations that are quadratic functions of instantaneous vehicle speed and acceleration were formulated. Coefficients for these equations were obtained by regression analysis of the emissions data collected from the SDS testing program. Separate equation coefficients were established for 11 vehicle categories according to model year groupings and location.

The original model was based on data from 1,020 light-duty vehicles tested in 1972. Tested vehicles included 15 different makes and 15 different model years (1956 through 1971). Testing was performed in six different cities, with 170 vehicles tested in each city. The data base used in the model has had limited updating, the last one (1972 through 1975 model year vehicles) occurring in 1977.

The main advantage of this model is that its focus on vehicle driving modes leads to easy correlation with traffic behavior at traffic intersections. Accordingly, this model has formed the basis for most intersection air quality modeling procedures.

Yet the model does have certain disadvantages. For example, the model gives emission rates for the light-duty vehicle fleet in a particular year only. In the first version, the model gives emission rates for the year 1972, and in the updated version, the model gives emission rates for the year 1975. This implies that the model is not capable of predicting emissions from future vehicle fleets. Also, the time history of vehicle operations is not taken into account. Hence the influence of vehicle operating mode (cold start, hot stabilized, etc.) is not reflected in the results. The SDS testing protocol used vehicles in an as-received condition, with no control exercised over major factors influencing emission rates. Since the model uses data from the SDS protocol, the results reflect this shortfall.

The MOBILE series of models which superseded the Modal Analysis Model was developed to predict current and future emissions under a variety of traffic and environmental conditions. Extensive emissions data from the FTP testing procedure were used in the development of these models. Emissions are predicted for eight categories of vehicles in the latest version of this model (MOBILE4.1): Light-duty gasoline vehicles, light-duty gasoline trucks I &II, light-duty diesel autos, light-duty diesel trucks, heavy-duty gasoline vehicles, heavy-duty diesel trucks, and motorcycles.

The basic test conditions under which light-duty vehicles are tested are as follows (Ref 20):

ambient temperature range is 68°F to 86°F;

absolute humidity is adjusted to 75 grains of water per pound of dry air;

average speed is 19.6 mph with 18% idle operation;

average percent of vehicle-miles-traveled (VMT) in a cold start operation is 20.6%;

average percent of VMT in a hot start operation is 27.3%;

average percent of VMT in the stabilized operation is 52.1%;

- average trip length is 7.5 miles;
- air conditioning not in use;
- · vehicle contains driver and passenger (no additional load); and
- vehicle is not pulling a trailer.

The emissions calculation in the MOBILE models have been structured in the following manner. To begin with, basic exhaust emission rates are calculated from data on in-use vehicles with no observed tampering. The basic exhaust emissions are assumed to deteriorate from the zero mile level emissions at a constant deterioration rate. These basic emission rates are then corrected for observed operating modes (% hot start, % cold start, etc.) and observed ambient temperatures. Emissions offsets are added to these values to correct for all types of tampering (such as catalyst removal, air pump tampering). Model year weightings are then applied to account for the fraction of total vehicle miles driven by each model year. These weighted values are then summed over 20 model years to obtain the emission value for the given category of vehicles.

The average route speed used in the MOBILE models does not represent either an instantaneous speed or a constant speed condition. It encompasses a driving cycle (idling, acceleration, cruising and deceleration) having the identified average speed. Furthermore, the amount of idling, acceleration, cruising, and deceleration inherent in emission rates from the MOBILE series of models is not constant. The assumed mix of driving mode patterns is itself a function of average route speed.

With respect to their advantages, the MOBILE models are based on vehicle testing data that are much more extensive than those of the Modal Analysis Model. The MOBILE models consider such factors as temperature, operating mode, tampering programs, inspection, and maintenance programs in the estimation of the emissions. Because of the FTP basis of the data, these models also have future prediction capability.

The main disadvantage of the MOBILE models is their inability to estimate the emissions by mode (i.e., accel., decel.).

One of the current applications of the MOBILE models is in the preparation of the mobile source emissions inventory used as a component of State Implementation Plans. In addition to the Modal Analysis Model and the MOBILE series of models, a number of other emission and dispersion models have been developed for such specific applications as intersection air quality modeling or highway air quality modeling. Some of these will be discussed in the following section.

INTERSECTION AIR QUALITY MODELS

The importance of modeling air quality at intersections has gained currency in recent years. This concern is attributable to the unusually high levels of pollution associated with hightraffic-volume urban intersections and with the congestion and delays concomitant with high volumes of crossing traffic. Other factors (e.g., tall buildings surrounding the intersection) act as impediments to the dispersion of the pollutants.

As was discussed above, emission levels of pollutants vary widely with the mode of operation of the vehicle. At intersections, vehicles need to decelerate to a halt near the stop line, idle at the stop line while waiting for their right of way, and accelerate to cruise speed when leaving the intersection. The proportions of each of these modes are dependent on such traffic parameters as volume, capacity, and green time. Modal emission rates are therefore required to model the air quality near intersections.

To reiterate: The Modal Analysis Model that estimates emissions by mode has had limited updating. In addition, it does not have any future year prediction capabilities. On the other hand, the MOBILE models, which do have future year prediction capabilities and which are updated frequently, do not have the ability to predict emissions by mode (except for idling emissions). Hence, the approach while modeling intersection air quality has been to use a combination of the two models, employing the adjustment procedures unique to each intersection model.

Four intersection air quality models with adjustment procedures that are representative of most models are discussed here. They are the Intersection Midblock Model (IMM) (Ref 21), MICRO2 (Ref 22), TEXIN2 (Ref 23), and CALINE4 (Ref 10). Table 2.4 summarizes the emissions adjustment procedures used in these four models.

Intersection Midblock Model (IMM)

The basic emission model in the IMM is the 1977 update of the Modal Analysis Model. The emission rates from this model are for the 1975 vehicle fleet and are extrapolated to the 1977 fleet using MOBILE1 deterioration rates. Correction factors are then computed for these modal rates as ratios of MOBILE1 rates for actual versus base scenarios. The base scenario represents conditions in the Modal Analysis Model: a 1977 calendar year, 100 percent hot stabilized operating mode conditions, a temperature of 75°F, a light-duty vehicle fleet, and the average speed of the user-defined driving sequence. The actual scenario conditions are for the calendar year of the analysis, with the assumed vehicle mix, operating mode mix, and ambient air temperature representative of the given calendar year. The average speed is the same as that for the base scenario.

TABLE 2.4. INTERSECTION AIR QUALITY MODEL EMISSION RATE ADJUSTMENTS

Model	Driving Mode	Base Emission Rate	Base Rate Multiplier
IMM	Idle	MOBILE1 idle rate	5 mph MOBILE1 rate ratio, actual: base scenarios
	Cruise	Modal Analysis Model cruise rate	MOBILE1 rate ratio for mean cruise mode speed, actual: base scenarios
	Acceleration	Modal Analysis Model acceleration rate	MOBILE1 rate ratio for mean acceleration mode speed, actual: base scenarios
	Deceleration	Modal Analysis Model deceleration rate	MOBILE1 rate ratio for mean deceleration mode speed, actual: base scenarios
MICRO2	Idle	Normalized SDS: FTP idle rate	none
	Cruise	Normalized SDS: FTP idle rate	none
	Acceleration	MOBILE scenario rate	E=0.182-0.0079776(AS) +0.00036227[(AS) ²]
	Deceleration	Normalized SDS: FTP idle rate	none
TEXIN2	Idle	MOBIL F3 idle rate	none
	Cruise	MOBILE3 scenario rate	none
	Deceleration/	Modal Analysis	MOBILE3 rate ratio, cruise:base scenarios
	Acceleration	Model rates for default speed profiles	
CALINE4	Idle	MOBILE idle rate	none
	Cruise	16.2 mph MOBILE scenario rate	E = [0.494 +0.000227(S ²)]
	Acceleration	16.2 mph MOBILE scenario rate	$E = 0.76[e^{(0.045AS)}] \text{ or}$ E = 0.027[e^{(0.098AS)}]
	Deceleration	MOBILE idle rate	E = 1.5

E = multiplier used to adjust base emission rate. A = acceleration rate; S = speed. Units vary by model.

^aSpecific MOBILE series versions are indicated only for intersection models that code specific emission rates into the model. Source: Ref 18

MICRO2

Vehicle emission rates in the MICRO2 model are based on data from 45 light-duty, 1975 vehicles tested in Denver using the SDS driving cycle. The ratio of time rate of modal emission to the average time rate of FTP emissions (termed E) was used as the dependent variable; the modal acceleration-speed product (AS) was used as the independent variable to obtain an acceleration correction factor for the MOBILE emission rates. The strong correlation between E and AS exists because of the following (Ref 22): AS is equivalent to power per unit mass. Hence the power expended by a vehicle during an acceleration event is directly related to the value of AS for the event. As power demand approaches engine capacity, a vehicle burns fuel less efficiently, resulting in higher emissions.

Internally, the MICRO2 program assumes a constant value of 80.667 ft^2/s^3 for the accelspeed product, representing an average acceleration of 2.5 mph per second between 0 and 30 mph. Also, the model assumes a constant emission rate for idling, cruise, and deceleration.

TEXIN2

The emissions adjustment procedure in TEXIN2 is similar to that used in the IMM. No correction is applied to the idle emission rate from the MOBILE3 model. The cruise emission rate is assumed to be the same as the MOBILE3 model scenario rate, with the average route speed equal to the cruise speed.

Data from the 1977 update of the Modal Analysis Model was used to compute emissions for selected acceleration-deceleration patterns. These estimates are multiplied by correction factors from Actual:Base scenario runs of the MOBILE model, in a manner similar to that used in the IMM.

CALINE4

Adjustment procedures similar to that in MICRO2 are used in CALINE4. No correction is applied to idle rates from the MOBILE model. Deceleration emission rates are assumed to be 1.5 times the idle rates. This assumption was based on an analysis of data from California Air Resources Board (Ref 24), (CARB) and EPA (Ref 25). This was found to be compatible with the practice of gradually releasing the accelerator pedal during a planned deceleration.

Cruise adjustment factors are computed as a quadratic function of speed. This is consistent with the fact that the drag force on the vehicle is proportional to the square of the speed.

Acceleration mode adjustment factors are calculated as an exponential function of the acceleration-speed product (AS). These relations were derived using data from CARB and EPA.

The adjustment procedures in the models described assume that driving mode emission rates from the Modal Analysis Model respond to emission rate variables in a manner and to an extent similar to that associated with weighted composite rates from the MOBILE series of models. Since the Modal Analysis Model and the MOBILE series of models do not share a common

structural or functional basis, the accuracy of the emission rates computed by the composite intersection models is questionable. A more detailed review of these intersection air quality models and their drawbacks can be found in the paper by Sculley (Ref 19).

SUMMARY

A review of emission modeling techniques currently in use was presented in this chapter. From these discussions it can be seen that there is clearly a need for a more comprehensive modal emissions model using current emissions data. But, until such a model is developed, any meaningful emissions modeling with modal data requirements will have to make do with adjustment procedures involving the Modal Analysis Model, the MOBILE models, and other limited sets of modal emissions data that have been collected.

The traffic model for characterizing the workzone problem will be discussed in the next chapter.

CHAPTER 3. A METHODOLOGY FOR THE PREDICTION OF WORKZONE EMISSIONS

The definition of the traffic to be modeled has a direct influence on the amount of emissions attributable to that traffic. Hence, the first step in the effort to model emissions at a workzone is to characterize, as accurately as possible, the workzone traffic. This will lead to a delineation of the areas where excess emissions occur as a result of the workzone.

The flow of traffic in the region of a workzone on a freeway is unique to the extent that it needs to be described by a combination of free flowing traffic and stop-and-go traffic. When the traffic volumes are not high enough to cause congestion and queuing, the traffic can be characterized entirely by the volume and the speeds. When congestion occurs, additional information, such as queue lengths, is also required to characterize the traffic. Hence, a traffic model that is capable of comprehensively defining the workzone problem is required.

The objective of this chapter is to present a general procedure for the calculation of workzone mobile source emissions. First, common workzone types are described; then, traffic passing through a workzone is characterized. Based on this information, a general methodology is developed. The data requirements for implementing this methodology leads to the definition of the traffic model required. The details of this model will be discussed in the next chapter.

TYPES OF WORKZONES

A workzone, work area, and work site denote the general location of work activity or the subject of a work area traffic control (Ref 26). Urban freeways, because of their high traffic volumes, have maximum impact in terms of the amount of mobile source emissions generated at workzones. Therefore, much of the present effort will be concentrated on predicting emissions at urban freeway workzones. To begin with, it is necessary to layout the different possible workzone configurations in terms of the manner in which the work area is defined; from these configurations we will identify those workzones most commonly used in urban freeways.

Reference 1 consists of an annotated glossary of the concepts, definitions, and standard terminology currently used and advocated in traffic control for highway construction, maintenance, and related activities. The following is a list of possible workzone configurations presented in Ref 26.

(1) Closure: A closure is the taking of any portion of the roadway for the exclusive use of a work activity. Closures may involve any of the following: a shoulder; one or more lanes; any combination of lanes or shoulders, or both; a direction of a roadway; or the entire highway. The portion of the roadway remaining, if any, after the closed portion is temporarily removed from service is available for traffic passing through the work area.

(2) Lane Closure: A lane closure involves the closing of a traffic lane in such a manner that traffic is forced to move out of the closed lane and into another lane, reducing the total number of

lanes. On a multilane roadway, a merging operation is involved. On a two-lane, two-way roadway, alternating directions of traffic must use the remaining lane (typically controlled by flaggers).

(3) Traffic Shifting: Traffic shifting is the lateral displacement of one or more travel lanes from their normal travel path, an arrangement required to accommodate a work space in the roadway. All lanes are carried through and no merging operations are involved. Traffic shifting may be accomplished by several means, including lane narrowing, use of shoulders, and use of opposing roadway.

(4) Traffic Splitting: Traffic splitting is the situation encountered on a multilane roadway where open travel lanes are carried around both sides of a work space. An island work space is formed, with traffic on both sides. It is preferable to avoid this situation, where feasible, since high accident rates are associated with this workzone type.

(5) Lane Narrowing: Lane narrowing is a reduction in lane width for those lanes carried through the activity area in order to maintain the maximum number of open lanes while accommodating the needs of the work activity.

(6) Median Crossover: In the context of workzone closures, a median crossover occurs where one directional roadway is closed to traffic; that direction of travel is carried diagonally across the median onto the other directional roadway.

(7) Detour: A detour is initiated when traffic is directed to leave the normal roadway. Two types of detours are possible. An on-site detour occurs where traffic is diverted onto a temporary roadway generally constructed within or adjacent to the right-of-way or onto a frontage road. An off-site detour occurs where traffic is diverted onto another highway in order to bypass the work site.

Of the above listed closure types, the most commonly employed on urban freeways are lane closure, lane narrowing, and median crossover. Traffic shifting by itself is not usually employed. More commonly, traffic shifting and lane narrowing are adopted in combination. Construction of an on-site detour is not normally possible in an urban area because of right-of-way constraints. Off-site detours, such as major arterials, are used for traffic diversion in conjunction with lane closure and other techniques as a means of reducing the traffic demand at the workzone. In this regard, off-site detours are not stand-alone options in the urban context.

For the above stated reasons, lane closure, median crossover, and lane narrowing are the main closure types attributable to urban workzones. Accordingly, these closure types were selected to predict workzone mobile source emissions in this study.

CHARACTERISTICS OF TRAFFIC AT A WORKZONE

Traffic passing through a workzone can be broadly characterized in three ways from the viewpoint of emission prediction:

(1) Vehicles proceeding undelayed through the workzone: When the capacity of the workzone is sufficiently greater than the demand, the vehicles passing through the workzone are processed without any delay whatsoever. In other words, the presence of the workzone has no

impact on the traffic. Because this scenario does not contribute to excess emissions over what is caused in the absence of the workzone, it need not be considered in the calculations. Very low traffic demand during off peak hours, or low traffic demand during usual high traffic periods as a result of good public information about the presence of a workzone are examples of this scenario.

(2) Vehicles proceeding through the workzone at a reduced speed: As the traffic demand at the workzone nears the capacity of the workzone, the rate at which vehicles are processed through the workzone decreases, lowering the overall speeds of vehicles. This involves a deceleration from the approach speed to a minimum speed near the workzone, an acceleration to the workzone average speed from this minimum speed, travel at a lower average speed through the workzone, and an acceleration from the workzone speed to pre-workzone speed at the end of the workzone. These actions have implications from the emissions point of view, as vehicles emit more pollutants as they decelerate and accelerate. The lower average speeds in the workzone might also result in lesser pollution when compared with the case in which vehicles proceed unhindered at higher average speeds. Hence, appropriate emissions calculations will have to be carried out for this scenario. The characteristics of this traffic behavior are illustrated in Figure 3.1, while the data required and emissions calculations to be performed for this scenario are tabulated in Table 3.1.



Figure. 3.1. Traffic behavior near a workzone (no queue formation).

(3) Vehicles stoppage near the workzone caused by queue formation: When the traffic demand at the workzone exceeds the capacity of the workzone, queue formation takes place upstream of the workzone. This occurrence is quite common when the traffic demand is at its peak. Vehicles in this situation decelerate from the approach speed until they are idling at the end of the queue; they also make short acceleration-deceleration movements (creeping motion) as they progress through the queue, accelerate to workzone speed at the beginning of the workzone, pass through the workzone at the average workzone speed, and accelerate to preworkzone speeds at the end of the workzone. Because this scenario has the maximum impact in

terms of excess emissions calculations, an appropriate analysis will have to be carried out. The characteristics of this traffic behavior are illustrated in Figure 3.2, while the data required and emissions calculations to be performed for this scenario are tabulated in Table 3.2.

TABLE 3.1. DATA REQUIRED AND CALCULATIONS TO BE PERFORMED FOR THE SCENARIO IN FIG. 3.1

Data Required	Calculations
Approach Speed	Avg. emissions associated with deceleration
Length of Deceleration Zone	Avg. emissions associated with lower-speed travel
Length of Acceleration Zone 1	Avg. emissions associated with acceleration
Workzone Average Speed	
Length of Workzone	
Length of Acceleration Zone 2	
Average Vehicle Emission Rates	
Vehicle Mix	
Vehicle accel-decel characteristics	
Traffic Data	
Workzone Parameters	





TABLE 3.2. DATA REQUIRED AND CALCULATIONS TO BE PERFORMED FOR THE SCENARIO IN FIG. 3.2

Data Required	Calculations
Approach speed	Avg. emissions associated with deceleration
Length of deceleration zone	Avg. emissions associated with creeping
Length of queue	Avg. emissions associated with lower-speed travel
Average queue speed	Avg. emissions associated with acceleration
Length of acceleration zone 1	
Workzone average speed	
Length of workzone	
Length of acceleration zone 2	
Vehicle mix	
Vehicle accel-decel characteristics	
Traffic data	
Workzone parameters	
Average vehicle emission rates	

The above discussion on the characteristics of traffic flowing through a workzone gives some insight into how the emissions model can be structured based on the traffic flow. With this as the basis, a general procedure for the calculation of excess emissions resulting from the presence of a workzone will be presented in the next section.

CALCULATION PROCEDURE

The objective of this section is to present a methodology to predict excess vehicle emissions as traffic passes through a workzone. Here, excess vehicle emissions are defined as the difference between the total emissions produced at and near the workzone (taking into account accel-decel, queue formation, etc.) minus those that would have been produced had the same number of vehicles cruised unhindered through the workzone.

The approach will be to determine the time spent by each vehicle in each mode of operation (accel, decel, cruise, queue) so that the average emission rates for each mode can be multiplied with the time spent in that mode to obtain the emission values. These emission values, when multiplied by the total number of vehicles in the analysis period, will give the total mass of pollutants. The mass of pollutants generated if the vehicles were traveling over the affected length in the absence of the workzone is also computed. The difference between the two gives the required excess emissions.

It is necessary to perform emissions calculations for only two of the three scenarios (presented in the previous section) that characterize the flow of traffic at a workzone. These two cases are dealt with independently as follows.

Case I (no queue formation; see Fig. 3.1)

Let T be a time period (say 30 min. or 1 hr.) over which the flow near and at the workzone, along with the workzone characteristics themselves, can be assumed to exhibit uniform features. The time period T will be the smallest unit of time for which the calculations will be performed and the values of the output variables determined. Let V (vph) be the rate of traffic flow and C_{WZ} (vph) the capacity of the workzone during this time period. The following notation is used in the calculations:

- T = time period of analysis (hrs),
- V = rate of traffic flow (vph),

 C_{WZ} = capacity of the workzone in time period T (vph),

- $v_a =$ workzone approach speed (mph),
- vmin = minimum speed to which vehicles decelerate before the workzone (mph),
 - v_d = average speed through the deceleration zone (mph),
- v_{a1} = average speed through acceleration zone 1 (mph),
- v_{WZ} = speed through the workzone (mph),
- v_{a2} = average speed through acceleration zone 2 (mph),
 - d = constant deceleration rate of vehicles (ft/s^2),
 - a = constant acceleration rate of vehicles (ft/s²),
 - Id = distance over which deceleration occurs (ft),
- la1 = distance over which acceleration occurs in zone 1 (ft),
- I_{WZ} = length of workzone (ft),
- la2 = distance over which acceleration occurs in zone 2 (ft),
 - total length over which vehicles are affected due to the presence of the workzone (ft),
- t_d = time taken for deceleration from v_a to v_{WZ} (sec),
- t_{a1} = time taken for acceleration from v_{min} to v_{wz} (sec),
- t_{WZ} = time taken to pass through the workzone at v_{WZ} (sec),
- t_{a2} = time taken for acceleration from v_{wz} to v_a (sec),
 - t = total time to cross length I at normal approach speeds in the absence of the workzone,

- mpd = emission rate of pollutant p (m_{COd}, m_{HCd}, or m_{NOxd}) for carbon monoxides, hydrocarbons, and nitrogen oxides) emitted under deceleration at an average speed v_d. (gm/sec/vehicle),
- mpai = emission rate of pollutant p (m_{COd}, m_{HCd}, or m_{NOxd}) emitted under acceleration at an average speed v_{ai}. (gm/sec/vehicle), and
- mpcri = emission rate of pollutant p (m_{COd}, m_{HCd}, or m_{NOxd}) emitted while cruising at an average speed v_{cri}. (gm/sec/vehicle).

The time spent by each vehicle in each mode of operation can be arrived at using the following relationships developed (from kinematics) between the above defined variables for each of the zones shown in Figure 3.1.

Deceleration Zone

All vehicles decelerate from the approach speed to a minimum speed before the workzone. Assuming a constant rate of deceleration, for this zone:

$$l_{d} = 1.47^{*}v_{a}^{*}t_{d} + 0.5^{*}d^{*}t_{d}^{2}$$
 (ft)

$$t_{d} = \frac{1.47^{*}(v_{min} - v_{a})}{d}$$
 (sec), and

$$v_{d} = \frac{l_{d}}{t_{d}}$$
 (ft/sec)

Acceleration Zone 1

All vehicles accelerate from the minimum speed to the average workzone speed. Assuming a constant acceleration rate for this zone, we arrive at the following:

la1	=	2 1.47*v _{min} *t da1+ 0.5*a*ta1	(ft)
^t a1	=	<u>1.47*(v_{wz} - v_{min)} a</u>	(sec)
va1	=	<u>la1</u> ta1	(ft/sec)

Workzone

In this zone, vehicles travel through at a reduced average speed of vwz.

$$t_{WZ} = \frac{l_{WZ}}{(1.47^* v_{WZ})}$$

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Acceleration Zone 2

At the end of the workzone, all vehicles accelerate from the slower workzone speeds to pre-workzone approach speeds.

$$\begin{aligned} &|_{a2} = 1.47^* v_{wz}^* t_{a2} + 0.5^* a^* t_{a2}^2 & \text{(ft)} \\ &=> t_{a2} = \frac{1.47^* (v_a - v_{wz})}{a} & \text{(sec)} \\ &v_{a2} = \frac{l_{a2}}{t_{a2}} & \text{(ft/sec)} \end{aligned}$$

Total

The total length and total time over which traffic is affected by the presence of the workzone are:

$$I = I_d + I_{WZ} + I_a$$
 (ft)
$$t = \frac{I}{V_a}$$
 (sec)

Therefore, the total emission of pollutant p (in gms) from all vehicles V resulting from the workzone will be:

$$E_{pwz} = \{m_{pd}^{*}t_{d} + m_{pcr1}^{*}t_{wz} + m_{pa1}^{*}t_{a1} + m_{pa2}^{*}t_{a2}\} V^{*}T$$

Emission of pollutant p (in gms) over the length I from all vehicles V in the absence of the workzone will be:

$$E_{pn} = m_{pcr2}t*V*T$$

Therefore, the excess emission of pollutant p (in gms) caused by the presence of the workzone will be:

$$DE_p = E_{pwz} - E_{pn}$$

Case II (queuing occurs, see Fig. 3.2)

As in the previous case, let T be a time period (say 30 min. or 1 hr.) over which the flow near and at the workzone, along with the workzone characteristics themselves, can be assumed to exhibit uniform features. Let V vph be the rate of traffic flow and C_{WZ} vph the capacity of the workzone during this time period. The following additional notation over that presented for the previous case is made use of in the following calculations:

- $I_{\rm q}$ = average queue length over time period T (ft),
- v_q = average speed of vehicles in the queue (mph),
- tq = time taken to travel through the queue (sec),
- ta1 = time taken to accelerate from stopped condition to v_{wz} at the beginning of the workzone (sec),
- t_{a2} = time taken to accelerate from v_{wz} to v_a (sec), and
- m_{pi} = mass of pollutant p (m_{COd}, m_{HCd}, or m_{NOxd}) emitted while idling in the queue. (gm/sec/vehicle).

The time spent by each vehicle in each mode of operation can be arrived at as in the previous case using the following relationships developed (from kinematics) between the above defined variables for each of the zones shown in Figure 3.2:

Deceleration Zone

All vehicles decelerate and come to a stop at the end of the queue. Therefore:

$$l_d = 1.47^* v_a^{*t} d + 0.5^* d^{*t} d^2$$
 (ft)
 $t_d = \frac{-1.47^* v_a}{d}$ (sec)

Queuing Zone

Vehicles idle in the queue for an average period given by:

$$t_{q} = \frac{l_{q}}{(1.47^{*}v_{q})}$$
 (sec)

Acceleration Zone 1

At the end of the queue, vehicles accelerate from zero speed to the average workzone speed.

$$l_a = 0.5^* a^* t_{a1}^2$$
 (ft)
 $t_{a1} = \frac{1.47^* v_{WZ}}{a}$ (sec)

Workzone

In this zone, vehicles travel through at a reduced average speed of vwz.

$$t_{WZ} = I_{WZ} / v_{WZ}$$
 (sec)

Acceleration Zone 2

At the end of the workzone, all vehicles accelerate from the slower workzone speeds to pre-workzone approach speeds.

$$l_{a2} = 1.47^* v_{wz}^* t_{a2} + 0.5^* a^* t_a^2$$
(ft)
$$t_{a2} = \frac{1.47^* (v_a - v_{wz})}{a}$$
(sec)

Total

The total length and total time over which traffic is affected by the presence of the workzone are:

$$l = l_d + l_q + l_{a1} + l_{wz} + l_{a2}$$
(ft)
$$t = \frac{l}{v_a}$$
(sec)

Therefore, the total emission of pollutant p (in gms) from all vehicles V resulting from the workzone will be:

$$E_{pwz} = \{m_{pd}^{*}t_d + m_{pi}^{*}t_q + m_{pcr1}^{*}t_{wz} + m_{pa1}^{*}t_{a1} + m_{pa2}^{*}t_{a2}\} V^{*T}$$

Emission of pollutant p (in gms) over the length I from all vehicles V in the absence of the workzone will be:

$$E_{pn} = m_{pcr2} t^* V^* T$$

Therefore, excess emission of pollutant p (in gms) resulting from the presence of the workzone will be:

$$DE_p = E_{pwz} - E_{pn}$$

IMPLEMENTATION

In order to implement the methodology presented in the previous section, data on workzone capacities, speed-flow relationships at workzones, length of workzone, and length of queues will be required.

The QUEWZ model (Ref 7), which is a Queue and User Cost Evaluation Model for Work Zones, fulfills most of these data requirements. The applicability of this model to the problem at hand, together with the implementation of the methodology, is discussed in subsequent chapters.

CHAPTER 4. THE WORKZONE TRAFFIC ANALYSIS MODEL

The implementation of the methodology described in Chapter 3 requires a comprehensive workzone traffic analysis model. And in building an emissions model, one should seek the traffic analysis model that satisfies the following data requirements:

- (1) Workzone capacity
- (2) Speed-Flow relationship
- (3) Length of workzone
- (4) Average length of the queue over time period T
- (5) Average vehicle speeds in the queue
- (6) Vehicle mix
- (7) Acceleration and deceleration rate of vehicles
- (8) Emission rates (mpd, mpa, mpcr, and mpi)

This chapter describes the development of a traffic model that fulfills these minimum requirements. To start with, the applicability of the QUEWZ model (Ref 7) to the problem at hand is discussed. Then, each of these data requirements is described in detail. Finally, the manner in which the QUEWZ model addresses these data requirements is discussed.

APPLICABILITY OF THE QUEWZ WORKZONE MODEL

QUEWZ is a workzone model that can be used to calculate the user costs resulting from workzone lane closures. QUEWZ calculates the delay costs and speed-change cycling costs that accrue when motorists are forced to slow down to go through a workzone; it also calculates the change in vehicle running costs that occurs as motorists proceed through the workzone. If a queue forms, the delay costs, speed-change cycling costs, and change in vehicle running costs in the queue are also estimated. The model estimates the average length of queue each hour.

The model can examine a variety of workzone configurations and schedules. The configurations fall into two general categories: (1) lane closures in a single direction of travel, and (2) crossovers, where one or more lanes are closed in both directions of travel. The workzone schedules are in the form of user input times of closure. The model uses hourly traffic volumes and data concerning capacities and average speeds in and around workzone sites in Texas.

A modified version of the QUEWZ model (Ref 6) computes the excess energy consumption resulting from a workzone in terms of car fuel, car oil, truck fuel, and truck oil. This model is an appropriate building block in the context of workzone emissions prediction. The shell of the model, the associated workzone data, and the queue length estimation routine can be used for performing the necessary emission calculations stated in the previous section. The addition of emissions capabilities to the modified QUEWZ model will make it a comprehensive workzone analysis package in terms of evaluation of user impacts, energy impacts, and environmental impacts.

DATA REQUIREMENTS

All of the data requirements stated before will be addressed in this section, both in general terms and in terms of how they are handled by the QUEWZ model.

Workzone Capacity

Estimation of an appropriate workzone capacity is vital to the calculation procedure described in the previous chapter. The main effect of work activities on freeways is the reduction in capacity at the work sites regardless of whether the activities involve closure of one or more lanes. These reduced workzone capacity values will be useful for (1) determining queue lengths and (2) estimating approach speeds and average workzone speeds using an appropriate speed-flow curve.

The earliest study on the subject of capacities at urban freeway workzones was made by Kermode and Myyra (Ref 27). They attempted to correlate observed capacities on the San Diego expressway in California with the type of construction activity (e.g., median barrier or guard rail repair, pavement repair, mudjacking, pavement grooving, or striping). Because the capacities were estimated using 3-minute observations of maximum flow rates past the workzone, these correlations tend to overestimate the hourly capacity.

The Dudek and Richards (Ref 28) study on the impact of lane geometry on capacity at a number of work sites in Texas is probably the most complete on this subject. This study, the results of which were used in the 1985 Highway Capacity Manual (Ref 29), will be discussed in greater detail later in this section.

Dudash and Bullen (Ref 30) observed single-lane capacities during reconstruction activity on the Penn Lincoln Parkway, Interstate 376, located in Pittsburgh, Pennsylvania. Their observations were comparable to those reported in Texas and California.

Many factors that affect capacities through workzones have been identified by different authors. At the macroscopic level, capacity depends on the lane geometry (i.e., the number of lanes and the number of open lanes), the time of work, and the type of work activity. Nighttime construction activity, for example, has a greater impact on capacity than daytime operations. (Variations in lighting and motorists' uncertainty about the construction site during the night generate such impact differences.) Zhang (Ref 31) presented the following simple equation relating workzone capacity to different factors:

$$C_{WZ} = f(C_b, T, N_{td}, N_o, Time)$$

where

C_{wz} = capacity through workzone per lane per hour,

 $C_b = basic capacity,$

T = type of work,

- N_{td} = total number of lanes in the operation direction,
- N_0 = number of lanes open to traffic, and
- Time = day or night (time of work activity).

Furthermore, they developed a capacity matrix based on the studies by Kermode and Myyra (Ref 27), and by Dudek and Richards (Ref 28). This capacity matrix was then evaluated by experts from the Committee on Freeway Operations of the Transportation Research Board and from CALTRANS (California Department of Transportation). The best estimate of lane capacity values based on their study is presented in Table 4.1.

TABLE 4.1. SUGGESTED RESULTING LANE CAPACITIES FOR SOME TYPICAL MAINTENANCE AND RECONSTRUCTION ACTIVITIES (REF 31)

No. of Lanes		Type of work [*]						
Normal	Open	1	2	3	4	5	6	Avg.
2	1	1400	1400	1250	1200	1200	1350	1300
	2***	1650	1650	1650	1650	1650	1650	1650
	1	1300	1050	1050	1050	1100	1350	1150
3	2	1550	1500	1400	1300	1200	1300	1350
	3***	1700	1700	1700	1700	1700	1700	1700
	1	1300	1050	1050	1050	1100	1350	1150
4	2	1550	1500	1400	1300	1200	1300	1350
	3	1550	1500	1300	1300	1200	1300	1350
	4***	1750	1750	1750	1750	1750	1750	1750
	1	1300	1050	1050	1050	1100	1350	1150
	2	1550	1500	1400	1300	1200	1300	1350
5	3**	1600	1550	1450	1400	1300	1400	1450
	4**	1700	1650	1550	1450	1350	1450	1500
	5***	1800	1800	1800	1800	1800	1800	1800

* Type of work:

1. Median barrier/guard rail repair or installation

2. Pavement repair

3. Resurfacing, asphalt removal

4. Stripping, slide removal

5. Pavement markers

6. Bridge repair

** Data not available. The capacity values are based on the values immediately above with a 6% increase.

*** Data not available. The values are based on authors' judgment.

The results of the study conducted by Dudek and Richards were used to estimate workzone capacities in the QUEWZ model. This study will now be discussed in greater detail.

Capacity studies were conducted at urban freeway maintenance and construction workzones in Houston and Dallas. Studies were conducted on five-, four-, three-, and two-lane freeway sections. Capacity data were collected at 37 work sites with ongoing work activity, and 4 work sites with no ongoing work activity. All volumes, measured while queues were formed upstream from the lane closure, essentially represent the capacity of the bottlenecks.

The average capacity for each closure situation studied is shown in Table 4.2. The data show that the average lane capacity for the 3/2 and 4/2 combinations was approximately 1500 vphpl. In comparison to this, the studies conducted at work sites with 5/2 and 2/1 closure situations indicate significant reductions in capacity. The average capacity for these two situations was approximately 1350 vphpl. Studies at 3/1 sites indicate a greater reduction in capacity. The average capacity was found to be only 1130 vphpl.

Taking into account that workzone capacities are site specific, QUEWZ gives the user the range of capacity values measured at sites in Texas for the specified workzone configuration. This gives the user some guidance in selecting a capacity value that is appropriate to the conditions for the problem at hand. The default value in the program is the average of the capacities observed at sites in Texas for the specified workzone configuration.

Number	of Lanes		Average	Capacity
Normal	Open	Number of Studies	(vph)	(vphpl)
3	1	5	1130	1130
2	1	8	1340	1340
5	2	8	2740	1370
4	2	4	2960	1480
3	2	8	3000	1500
4 3		4	4560	1520

TABLE 4.2. MEASURED WORKZONE CAPACITY (REF 28)

With no ongoing work activity at the workzones, capacities were found to be approximately 90 percent of the normal capacity of 2000 vphpl. Therefore 1800 vphpl was used in the QUEWZ model for this condition.

For those lane closure combinations which did not have capacity data (i.e., 4/1, 5/1, 5/3, 5/4, 6/1, 6/2, 6/3, 6/4, 6/5 combinations), the closure capacities used in Reference 9 were used. For 4/1, 5/1, and 6/1, an average capacity of 1200 vphpl was used. For 5/3 and 6/3, 1500 vphpl was used; for 5/4 and 6/4, 1550 vphpl was used; and for 6/5, 1580 vphpl was used.

Because the study by Dudek and Richards is the most complete on this subject, and since the results have already been used successfully in the QUEWZ model and are recommended in the 1985 Capacity Manual (Ref 29), we used their results to develop the emissions model.

Sand States

Speed-flow Relationship

Using the capacity values of the normal freeway section and the freeway section with a workzone, and assuming an appropriate speed-flow relationship, the approach speed and the speed at the workzone can be evaluated. The nature of the speed-flow relationship to be assumed for this purpose will be discussed here.

In the QUEWZ model, the normal approach speed and average speed through the workzone are computed from a relationship between speed and v/c ratio similar to that presented in the 1965 HCM (Ref 32). The assumed speed-flow curve is shown in Figure 4.1. The three speed parameters, SP_1 , SP_2 , and SP_3 , and the volume parameters V_1 and V_2 have preset default values that are used if the user does not specify speed and volume parameters. These default values are:

SP1	=	60 mph (free flow speed)
SP2	=	40 mph (level of service D/E breakpoint speed)
SP3	=	30 mph (speed at capacity)
V1	=	2,000 vphpl
V ₂	=	1,600 vphpl

The user has the option of modifying the parameters to reflect the speed-volume relationship more accurately on the freeway of interest.



Figure 4.1. Assumed speed-flow curve (Ref 7).

The hourly traffic volume specified by the user is converted into a v/c ratio, and the approach speed, in mph, is calculated using the following equations based on the assumed speed-flow curve. The equations are taken from the Highway Economic Evaluation Model, HEEM (Ref 33).

$$if \frac{V_2}{V_1} > = V/C, \text{ then}$$

$$SP = SP_1 + \frac{V_1(SP_2 - SP_1)}{V_2}(V/C)$$

$$if \frac{V_2}{V_1} < V/C < = 1, \text{ then}$$

$$SP = SP_3 + (SP_2 - SP_3) \left[1 - \left\{\frac{V/C - V_2/V_1}{1 - V_2/V_1}\right\}^2\right]^{1/2}$$

if V/C > 1 or a queue is present, then

 $SP = SP_3(2-V/C)$, with the speed constrained to the following range,

In the evaluation of average speed of vehicles through the workzone, there is some question about whether the speed-volume relationship for a workzone is the same as that for a normal freeway segment (Ref 34). Butler (Ref 35) concluded that the speed-volume relationship for workzones did correspond to the typical relationship for normal freeway sections in the 1965 HCM (Ref 32). Abrams and Wang (Ref 36) also used the typical relationships as the basis for their estimation of speeds through workzones. However, Rouphail and Tiwari (Ref 37) concluded that the speed-volume relationships at lane closures on four-lane freeways in Illinois differed considerably from those in the 1965 HCM (Ref 32). Additional research will be necessary to determine which conclusion is the most accurate.

The QUEWZ model calculates the average workzone speed, SP_{WZ} , using the same speed equations given above, assuming that the speed-flow relationship remains the same at a workzone. The same assumption will be made in the emissions modeling procedure.

Length of Workzone

The length of the workzone is required to define the flow of traffic around the workzone. Shorter workzones do not have as much of an effect on traffic as do long ones. Also, higher traffic volumes are affected over longer distances than are lower volumes.

The distance over which vehicles slow down through a workzone is not always the entire distance of restricted capacity (Ref 7). When the traffic volume is light, vehicles tend to slow down only when passing major work activity (e.g., paving). Hence, traffic volumes play a role in defining the length of the traffic affected by the workzone. Also, to account for the effects of average

speed being reduced upstream of the workzone, some adjustment needs to be made to the actual workzone length.

Taking these factors into account, the following adjustments are made to the actual workzone length in the QUEWZ model. A distance of 0.1 miles on each side of the workzone is included. If the workzone closure is less than 0.1 miles, then the QUEWZ model assumes traffic will slow down through the entire workzone. To account for the effect of traffic volumes, the following equations are used to estimate the effective length of closure, in miles:

 $l_{WZ} = 0.1 + (WZD + 0.1)(V/C_{WZ})$

where

WZD = length of restricted capacity around workzone, in miles. If WZD < = 0.1, or if V/C_{WZ} > 1, then I_{WZ} = WZD + 0.2

where I_{WZ} is the distance all vehicles travel at the reduced average workzone speed. These assumptions regarding the workzone length can also be carried through in the emissions model.

Average Length of Queue Over Time Period T

When the traffic demand exceeds the capacity of the workzone, queue formation takes place. The average length of the queue over the time period T is required to calculate emissions involving idling of the vehicles while in the queue.

The QUEWZ program uses a deterministic queuing model (Ref 7) to predict the queue lengths at the workzone. The deterministic model calculates queues as a simple integral of demand minus capacity over time, and hence predicts accurately only when demand substantially exceeds capacity, which is usually the case in urban freeway workzones. This queuing model used in QUEWZ is described in this section.

The model assumes that there will be no change in demand as the queue forms, and that no traffic will divert to avoid the queue. If vehicles are assumed to arrive at a constant rate during a given hour, and then enter the workzone at a constant rate during a given hour, then the average delay for each hour a queue is present (DQUE), in vehicle hours, is simply the average of the accumulated vehicles in the queue at the beginning of hour i (ACUM_{i-1}) and at the end of the hour i (ACUM_i),

$$DQUE_{i} = \frac{ACUM_{i-1} + ACUM_{i}}{2}$$

where

$$ACUM_i = ACUM_{i-1} + VL_i - C_{WZi}$$

Cwzi = restricted capacity through workzone (vph) for hour i, and

VLi = vehicle demand during hour i.

If the queue dissipates during hour i, then the delay calculation must be modified by the proportion of the hour that a queue was present (PQUE_i).

$$PQUE_{i} = \frac{V_{i-1}-C_{i-1}}{(C_{i}-C_{i-1}) - (V_{i}-V_{i-1})}$$

$$= \frac{ACUM_{i-1}}{C_{WZi} - VL_i}$$

Average delay is then calculated as

$$DQUE_{i} = \frac{ACUM_{i-1}}{2} PQUE_{i}$$

From this, the average length of queue QUEL_i can be estimated assuming that each vehicle occupies 40 feet (including spacing between vehicles), and that vehicles in the closed lane(s) will merge to the open lane(s) after the queue has formed. In reality, the number of vehicles remaining in the closed lane(s) is a function of the sight distance to the workzone and traffic volumes.

Studies by Richards and Dudek (Ref 38) revealed that as sight distance to a lane closure decreases, more and more drivers are "trapped" in the closed lane at the taper area. Also, sight distance is more critical as traffic volumes increase.

Research by Nemeth and Rouphail (Ref 39) in the area of merging at workzones has produced the following results. Under low-volume conditions, drivers' merging patterns and travel speeds are virtually unaffected by the advance warning devices at the site. Speeds and/or lane changes are initiated only when the construction activity is actually in sight. At higher volumes, however, many drivers merge early. The study indicated that at sites experiencing approach volumes in excess of 1000 vph, it is desirable that early merging be encouraged. It is also suggested that traffic engineering measures that deter travel in the closed lane (i.e., signs saying "lane to be closed ahead") be contemplated.

The model used in the study by Nemeth and Rouphail (Ref 39) assigned a set of merge and speed stimuli to each vehicle. This assignment was based on a survey of 229 drivers conducted at several freeway construction lane-closure sites. Among the results of the survey were the following: 45.4 percent of the drivers merge at the earliest opportunity; 13.1 percent of drivers merge after having passed a few cars; 9.3 percent of drivers merge after having seen other drivers merge; 20.5 percent of drivers merge after having seen construction activity; and 11.7 percent gave no answer. But, the results of the application of the model indicated that merge patterns were dependent on traffic volumes also. As shown by the above studies, merging of vehicles at workzones involves a complex interaction of driver behavior, sight distance to beginning of closure, and traffic volumes. As a result of this, queue lengths will not be uniform over all lanes of the freeway. Considering the uncertainties involved in the merge patterns, until further research is conducted in this area, the assumption made in the QUEWZ model that vehicles in the closed lane(s) will merge to the open lane(s) after the queue has formed seems to be a reasonable one. Based on this assumption, the queue length was estimated in the following manner in the QUEWZ model:

$$QUEL_i = \frac{40(DQUE_i)}{5280(TL)}$$

where

TL = total number of lanes upstream of the workzone.

For the hour when the queue dissipates

$$QUEL_i = \frac{40(DQUE_i)}{5280(TL)PQUE_i}$$

Average Vehicle Speeds in a Queue

.

The average speed at which vehicles creep through a queue is required so that the time spent in the queue can be estimated using the speed and the length of the queue. The average speed through the queue can be estimated using a kinematic wave model developed by Messer (Ref 40) for predicting travel time on an urban freeway. The QUEWZ model uses this result to estimate the average speed (v_q , mph) as follows:

$$v_{q} = \frac{SP_{1}}{2} \left[1 - \left(1 - \frac{C_{WZ}}{C_{ap}} \right)^{1/2} \right]$$

where

 $C_{ap} = normal capacity (vph),$

C_{WZ} = workzone capacity (vph), and

SP = free flow speed (mph).

Vehicle Mix

The methodology presented in the previous chapter is also applicable to the case in which the traffic is composed of a mix of different kinds of vehicles (passenger cars, single-unit trucks, truck-trailers, etc.) which have different emission characteristics. The various parameters

required for the calculations, which include the accel-decel characteristics, emission characteristics, and speeds, will have to be specified for all vehicle categories. For the purpose of our analysis, it will be sufficient to consider only two main types of vehicles: passenger cars and trucks.

Acceleration and Deceleration Rates of Vehicles

The calculation procedure in the previous chapter assumes constant acceleration and deceleration rates for passenger cars and trucks. In actual freeway conditions, accel.-decel. characteristics will be governed by vehicle type and driver attitudes. However, by assuming appropriate average representative values for these variables, it is expected that emission characteristics at the workzone can be adequately captured.

Observed normal roadway acceleration rates for passenger cars from standing stop to 15 mph and for 10 mph increases in speed at running speeds of 20, 30, 40, 50, and 60 mph are given in Table 4.3. These acceleration rates were observed when drivers were not influenced to accelerate rapidly. They are typical of passenger cars starting up after a traffic signal turns green and those on four-lane divided highways. Observed normal deceleration rates of passenger cars are also given in Table 4.3.

Based on the values shown in Table 4.3, an average acceleration rate of 3.0 mph/s (4.5 ft/s^2) and an average deceleration rate of 4.0 mph/s (6 ft/s^2) is assumed for passenger cars. These values are consistent with the average accel.-decel. rates for 0-30 mph speed changes given in the AASHTO (Ref 41) policy for passenger vehicles at intersections.

For trucks, an average acceleration rate of 1.1 mph/s (1.6 ft/s²) is assumed based on acceleration curves developed in the AASHTO policy for trucks at intersections. Also, an average deceleration rate of 1.5 mph/s (2.2 ft/s²) is assumed for trucks.

Speed Change	Accelerations	Decelerations
mph/s	mph/s	mph/s
0-15	3.3	5.3
0-30	3.3	4.6
30-40	3.3	3.3
40-50	2.6	3.3
50-60	2.0	3.3
60-70	1.3	3.3

TABLE 4.3. NORMAL ACCELERATION AND DECELERATION RATES FORPASSENGER CARS (REF 42)

Emission Rates (mpd, mpa, mpcr, and mpi)

The emission of each of the pollutants considered (CO, HC, and NO_X) varies by vehicle type and also by the mode of operation of the vehicle. These emission rates for passenger cars and trucks for different modes of operation (i.e., cruise, deceleration, idle, and acceleration) should be determined to permit application of the methodology described in the previous chapter.

As mentioned in the review of the literature, the determination of modal emissions is a complex problem, given the lack of data and models for this purpose. This problem will be addressed in Chapter 5.

SUMMARY

The traffic analysis model required to implement the emission prediction methodology presented in the previous chapter was discussed. The data requirements for the methodology and the use of the QUEWZ model in this context were also described. Next, the emission rate models that will complete all requirements for implementation will be discussed in Chapter 5.



CHAPTER 5. MODAL EMISSION RATE MODELING

In Chapter 2, we discussed the problems associated with obtaining modal emission rates for various pollutants. Additionally, we described the Modal Analysis Model (Ref 12), the MOBILE4.1 (Ref 16) model, and various adjustment factors of different intersection air quality models used to estimate modal emission rates. From the methodology for workzone mobile source emission prediction presented in Chapter 3 it is clear that modal emission rates similar to those used in these intersection air quality models will be required to implement the methodology.

In this chapter, we first present a summary of the general approaches used to obtain modal emission rates. This is followed by a description of the methodology used to obtain the modal emission rates for each pollutant, namely, CO, HC, and NOx. A description of the input values assumed in obtaining composite emission factors from the MOBILE4.1 model is then presented. The implementation of these models in QUEWZ will be the subject of the next chapter.

GENERAL APPROACHES

From the discussion of the intersection air quality models presented in Chapter 2, we identified two general approaches for modeling modal emissions. Table 2.4 from Chapter 2 is reproduced here as Table 5.1 to facilitate the following discussion.

One approach has been to use modal emissions from the Modal Analysis Model and to correct this using the ratio of the results from the MOBILE model for actual and base scenarios. The base scenario is for conditions used in the Modal model, namely, a 1977 calendar year, a light-duty vehicle fleet, 100 percent hot-stabilized operating conditions, a temperature of 75°F, and the average speed of the user-defined driving sequence. The actual scenario is for the corresponding conditions in the calendar year being modeled.

This approach is used in the IMM (Ref 21) and the TEXIN2 (Ref 23) models. The main problem associated with this approach is that for every speed at which modal emissions are required, the MOBILE model must be run for the base and actual scenarios for that speed. This implies that the MOBILE model should be merged with the traffic analysis model, which in the present context is the QUEWZ (Ref 7) model. If this is carried out, the workzone model will become very bulky, will require more inputs, and will take a much longer time to run. Also, only a specific version of the MOBILE model can be coded into the workzone model. Frequent updates of the workzone emissions model will be required as the EPA updates the MOBILE model.

The second approach has been to correct (using modal correction factors) the emission rates obtained from runs of the MOBILE model. These correction factors have been derived using limited sets of emissions data from the SDS and FTP driving cycle tests (Ref 18). The correction factors are usually functions of the vehicle speed and acceleration, as can be seen in Table 5.1. This approach has been used in the MICRO2 (Ref 22) and CALINE4 (Ref 10) models.

TABLE 5.1. INTERSECTION AIR QUALITY MODEL EMISSION RATE ADJUSTMENTS (REF 18)

Model	Driving Mode	Base Emission Rate	Base Rate Multiplier
IMM	Idle	MOBILE1 idle rate	5 mph MOBILE1 rate ratio, actual:base scenarios
	Cruise	Modal Analysis Model cruise rate	MOBILE1 rate ratio for mean cruise mode speed, actual:base scenarios
	Acceleration	Modal Analysis Model acceleration rate	MOBILE1 rate ratio for mean acceleration mode speed, actual:base scenarios
	Deceleration	Modal Analysis Model deceleration rate	MOBILE1 rate ratio for mean deceleration mode speed, actual:base scenarios
MICRO2	Idle	Normalized SDS:FTP	none
	Cruise	Normalized SDS:FTP	none
	Acceleration	MOBILE scenario rate	E = 0.182-
			0.0079776(AS)+ 0.00036227[(AS) ²]
	Deceleration	Normalized SDS:FTP idle rate	none
TEXIN2	ldle Cruise	MOBILE3 idle rate MOBILE3 scenario rate	none none
	Deceleration/ Acceleration	Modal Analysis Model rates for default speed profiles	MOBILE3 rate ratio, cruise:base scenarios
CALINE4	Idle Cruise	MOBILE idle rate 16.2 mph MOBILE scenario rate	none E = [0.494 +0.000227(S ²)]
	Acceleration	16.2 mph MOBILE scenario rate	$E = 0.76[e^{(0.045AS)}]$
	Deceleration	MOBILE idle rate	E = 0.027[e ^(0.098AS)] E = 1.5

E = multiplier used to adjust base emission rate. A = acceleration rate; S = speed. Units vary by model. ^aSpecific MOBILE series versions are indicated only for intersection models that code specific emission rates into the model.

Other approaches have also been adopted for such specific uses as estimating modal emissions from diesel vehicles. For example, the TEXAS model (Refs 43 and 44) uses the following approach to model diesel vehicle emissions. Diesel vehicle emissions data from the Southwest Research Institute (Ref 45), expressed in terms of engine RPM and torque, were used to develop regression equations for emissions as a function of vehicle speed and acceleration. This was achieved through the development of a motion equation that relates the engine RPM and torque to vehicle speed and acceleration.

The CALINE4, TEXIN2, and IMM programs were developed exclusively for modeling CO hot spots at intersections. The approach used for modeling modal CO emissions for the purpose of workzone emission prediction will follow closely the approach used in MICRO2 and CALINE4. The approach used in IMM and TEXIN2 is not used for reasons stated previously.

MICRO2 is the only program among these four which models HC and NOx emissions. The modal HC and NOx emission models for the workzone problem will make use of the results from the MICRO2 model.

All the modal emission rate models in the CALINE4 and MICRO2 programs were developed using data from light-duty gasoline vehicles. But, the workzone model also requires modal emission rates for diesel trucks. It is assumed that the behavior of diesel vehicles in different modes of operation is similar to that of gasoline vehicles. Therefore, the modal correction factors developed for passenger cars can be applied to the composite emissions from trucks to obtain the modal emission values.

The following sections describe the models adopted for the workzone problem. Each pollutant, namely, carbon monoxides, hydrocarbons, and nitrogen oxides, is handled separately for convenience and clarity.

MODAL CARBON MONOXIDE EMISSIONS

Idle Emissions

The MOBILE4.1 model, which is the recent update of the MOBILE series of models, provides idle emission factors for the hot-stabilized mode of operation. Hot-stabilized idle emissions have been included in the MOBILE models in order to facilitate quantification of emissions resulting from idling in queues. Some examples of such situations include queues at drive-through restaurants, queues at traffic lights, and queues at toll plazas.

The idle emission rates vary with the ambient temperature, vehicle mix, vehicle tampering rates, and calendar year. The scenario used for running the MOBILE4.1 model to obtain the idle emission rates is described in detail later in this chapter.

The variation of idle emissions with speed is shown in Figure 5.1. The data for this were obtained by running the MOBILE4.1 model for the scenario described below and for different average route speeds. A sample input file to the MOBILE4.1 model and output for the scenario described below for different average route speeds and an ambient temperature of 75°F is shown

in Appendix A. Also, a summary of the composite emission outputs for passenger cars and trucks is presented in Table 5.5.

All the plots in the sections that follow are for passenger car emissions only. Modal truck emissions can be obtained in the same manner by substituting the composite heavy-duty diesel vehicle emission factors for the passenger car emission factors.



Idle Emission Rate Model

Figure 5.1. Plot of idle carbon monoxide emission rate model for passenger cars.

Deceleration Emissions

The MICRO2 model assumes that emissions in the deceleration mode are constant and that they are equal to the idle emission rate. The CALINE4 model assumes not only that the deceleration mode emissions are constant, but also that they are equal to the MOBILE idle emission rate with a factor of 1.5. This was based on an analysis of the data from CARB (Ref 24). The CARB data contained deceleration emission rates that were relatively constant over the 16 deceleration modes of the SDS driving cycle. These rates were approximately 50 percent more than the idle emission rates.

This observation was found to be consistent with the practice of decelerating by gradually releasing the accelerator during a planned deceleration. In general, decelerations near a workzone can be assumed to be planned decelerations, owing to the presence of numerous signs warning the users of a workzone ahead. However, this is not true when queue formation takes place, as there are several sudden decelerations during this time. But, as an approximation, the deceleration emission rates at a workzone can be assumed to be a constant equal to 1.5 times the idle emission rates, as was done in the CALINE4 model.

The variation of deceleration emissions with speed is shown in Figure 5.2. The data are obtained in a manner similar to that described for idle emissions.



Deceleration Emission Rate Model

Figure 5.2. Plot of deceleration carbon monoxide emission rate model for passenger cars.

Cruise Emissions

The MICRO2 model assumes that emissions in the cruise mode are constant and that they are equal to the idle emission rate. But, as a vehicle cruises at higher speeds, the CO

emissions are known to increase. To account for this, the CALINE4 model uses a cruise correction factor applied to the MOBILE model scenario rate at 16.2 mph, a rate arrived at as follows.

SDS emissions test data for various idling, acceleration, cruise, and deceleration segments were given artificial time weightings to provide a simulated FTP stabilized mode sequence. Data from the cruise portion of the SDS testing cycle were then analyzed to develop correlations with the SDS simulation of the FTP stabilized mode emission rates. The dependent variable, as described above, was the ratio of SDS to FTP (simulated using SDS) emission rate. The independent variable was cruise speed. The following relationship was obtained from this analysis:

Cruise Emission Rate (gm/hr) =16.2 mph MOBILE scenario rate (gm/mi) *16.2 (mph) * (0.494 + 0.000227*S²)

Because the average speed of the hot-stabilized portion of the FTP cycle is 16.2 mph, and since only the hot-stabilized portion of the FTP cycle was used in deriving this relation, the 16.2 mph MOBILE scenario rate is used.

This result is consistent with the fact that the drag force on a vehicle cruising at a speed S is proportional to the square of the speed, S^2 . Hence, as the vehicle cruises at higher speeds, the higher drag force puts a greater load on the engine, leading to increased CO emissions.

This cruise model is used to represent cruise emissions for the workzone problem. As mentioned before, the scenario used for running the MOBILE4.1 model to get the 16.2 mph scenario rate will be described later in this chapter.

The variation of cruise emissions with speed is shown in Figure 5.3. The 16.2 mph MOBILE scenario rate was obtained by running the MOBILE4.1 model for the scenario described below and by using an average route speed of 16.2 mph.

Acceleration Emissions

The MICRO2 and CALINE4 models develop acceleration correction factors to the composite MOBILE emission value as a function of the product of acceleration and speed (AS). The following reasoning is given for the strong correlation between AS and the correction factor (Ref 46). The product of acceleration and speed is equivalent to power per unit mass. Therefore, the power expended by a vehicle during acceleration is proportional to AS. As power demand approaches engine capacity, vehicles tend to burn fuel less efficiently, resulting in higher carbon monoxide emissions.

The acceleration model in MICRO2, developed by The Colorado Department of Highways, was based on data from 45 light-duty 1975 vehicles tested in Denver on the SDS cycle (Ref 25). Results were analyzed using a ratio of the time rate of modal emissions and the time rate of FTP emissions. Use of this ratio allowed the direct conversion of average route speed emission factors to modal emission rates. The acceleration model developed through this analysis was:

Accel. Emission Rate (gm/hr) = MOBILE Scenario Rate (gm/mi) * S (mph) * $[0.182 - 0.00798(AS) + 0.000362*(AS)^2]$



Cruise Emission Rate Model

Figure 5.3. Plot of cruise carbon monoxide emission rate model for passenger cars.

with AS representing the product of the average acceleration and average speed for the acceleration event in units of ft^2/sec^3 . Internally, the MICRO2 model assumes a constant acceleration-speed product of 80.6667 ft^2/sec^3 , representing an average acceleration of 2.5 mph per second between 0 and 30 mph.

For each speed at which the acceleration emission rate is required, the MOBILE scenario rate needs to be determined for an average route speed equal to that speed. Figure 5.4 shows the variation of acceleration emissions with speed, as described by this acceleration model. The MOBILE scenario rates for each speed were determined by running the MOBILE model for the scenario described later in this chapter and for the required average route speed. The acceleration-speed product was assumed to be 97 ft²/s³, representing an average acceleration

of 3.0 mph/s (4.5 ft/s²) between 0 and 30 mph. This acceleration rate is consistent with the assumption made for passenger cars in section 4.2 (g) of Chapter 4.



Figure 5.4. Plot of the MICRO2 acceleration carbon monoxide emission rate model for passenger cars.

As can be seen from Figure 5.4, as the vehicle gains momentum the emission rate of carbon monoxides decreases. When the vehicle accelerates at high speeds, the emission rate increases rapidly, a result of the very high drag forces that possibly offset the gain in momentum.

The acceleration emission model in CALINE4 is patterned after the MICRO2 model. The dependent variable is again the ratio of the modal to FTP emission rates and the independent variable is AS, the acceleration speed product. However, an exponential functional form is used for the model. Also, separate forms of the model are used depending upon the initial conditions (vehicle at rest or moving).

Similar to the procedure used for cruise emissions modeling, SDS emissions test data for various idling, acceleration, cruise, and deceleration segments were given artificial time weightings to provide a simulated FTP stabilized mode sequence. Data from the acceleration

portion of the SDS cycle was than analyzed to develop correlations with the SDS simulation of the FTP stabilized mode emission rates.

The resultant acceleration models were developed from the combined CARB (Ref 24) and EPA (Ref 25) data sets (76 vehicles). The first model is for vehicles starting at rest and accelerating up to 45 mph:

Accel. Emission Rate (gm/hr) =MOBILE Scenario Rate at 16.2 mph (gm/mi) *16.2 (mph) * 0.76*e^(0.045AS)

with AS representing the product of the average acceleration and average speed for the acceleration event in units of mi^2/hr^2 -sec. The second model was developed for vehicles moving at speeds of 15 mph (or greater) and accelerating up to 60 mph. It was meant for handling such situations as acceleration emissions along on-ramp or weave sections. The model takes the following form:

Accel. Emission Rate (gm/hr) = MOBILE Scenario Rate at 16.2 mph (gm/mi) *16.2 (mph) * 0.027*e^(0.098AS)

The exponential functional form of these models results in very high prediction of emissions in the acceleration mode. Hence, the acceleration model used in the MICRO2 model was used for the workzone problem also.

In summary, the modal carbon monoxide emission rate models used for workzone mobile source emissions are shown in Table 5.2.

MODAL HYDROCARBON EMISSIONS

As mentioned previously, most modal emission modeling efforts in the past have concentrated mainly on carbon monoxide emissions. As a result, modal models for hydrocarbons and nitrogen oxides are not well developed. Therefore, to arrive at modal emission rates for the workzone model, several simplifying assumptions have been made.

As in the case for idle carbon monoxide emissions, hot-stabilized idle hydrocarbon emissions can be obtained directly from the base scenario run of the MOBILE4.1 model. The deceleration and cruise emission rates are assumed to be equal to the idle emission rate as in the MICRO2 model.

For emission of hydrocarbons under acceleration, the MICRO2 model uses correction factors to the composite MOBILE emission value as a function of the acceleration-speed product (AS). The hydrocarbon acceleration model in MICRO2 was developed in a manner similar to that described for carbon monoxide. The resulting equation is presented below.

Accel. Emission Rate (gm/hr) = MOBILE Scenario Rate (gm/mi) * S (mph) * $\{(0.018 + 5.266 \times 10^{-4} (AS) + 6.1296 \times 10^{-6} (AS)^2\}$

TABLE 5.2. SUMMARY OF MODAL CARBON MONOXIDE MODELS USED FOR WORKZONE MOBILE SOURCE EMISSION PREDICTION

MODAL CARBON MONOXIDE EMISSION RATE MODELS
IDLE EMISSIONS
= Hot Stabilized Idle Emission Rates from MOBILE4.1 Scenario (gm/hr)
DECELERATION EMISSIONS
= 1.5 * Idle Emissions (gm/hr)
CRUISE EMISSIONS
= 16.2 mph MOBILE4.1 Scenario Rate * 16.2 * (0.494 + 0.000227 S ²) (gm/hr)
ACCELERATION EMISSIONS
= MOBILE4.1 Scenario Rate * S * {0.182 - 0.0079776 AS + 0.00036227 (AS) ² } (gm/hr)

Again, internally the MICRO2 model assumes a constant acceleration-speed product of 80.6667 ft^2/s^3 , representing an average acceleration of 2.5 mph/s between 0 and 30 mph.

Figure 5.5 shows the variation of modal hydrocarbon emissions with speed, as described by the models discussed in this section. The MOBILE scenario rates for each speed were determined by running the MOBILE model for the scenario described below and for the required average route speed. As in the carbon monoxide model, the acceleration-speed product for the acceleration mode was assumed to be 97 ft²/s³, representing an average acceleration of 3.0 mph/s (4.5 ft/s²) between 0 and 30 mph.



Figure 5.5. Modal hydrocarbon emission rate models.

In summary, the modal hydrocarbon emission rate models used for workzone mobile source emission prediction are shown in Table 5.3.

MODAL NITROGEN OXIDES EMISSIONS

As in the case for idle carbon monoxide and hydrocarbon emissions, hot-stabilized idle nitrogen oxide emissions can be obtained directly from the base scenario run of the MOBILE4.1 model. The cruise emission rate is assumed to be equal to the idle emission rate as in the MICRO2 model.

For emission of nitrogen oxides under deceleration, the MICRO2 model uses correction factors to the composite MOBILE emission value as a function of the deceleration-speed product (AS). The nitrogen oxide deceleration model in MICRO2 was developed in a manner similar to the acceleration models for carbon monoxide and hydrocarbons. The resulting equation is presented below.

Decel. Emission Rate (gm/hr) = MOBILE Scenario Rate (gm/mi) * S (mph) * {0.00143 -1.7005x10⁻⁴ (AS)}

with AS representing the product of the average deceleration and average speed for the deceleration event in units of ft^2/sec^3 . Internally the MICRO2 model assumes a constant

deceleration-speed product of 80.6667 ft^2/s^3 , representing an average deceleration of 2.5 mph/s between 0 and 30 mph.

TABLE 5.3. SUMMARY OF MODAL HYDROCARBON MODELS USED FOR
WORKZONE MOBILE SOURCE EMISSION PREDICTION

MODAL HYDROCARBON EMISSION RATE MODELS

IDLE EMISSIONS

= Hot Stabilized Idle Emission Rates from MOBILE4.1 Scenario (gm/hr)

DECELERATION EMISSIONS

= Hot Stabilized Idle Emission Rates from MOBILE4.1 Scenario (gm/hr)

CRUISE EMISSIONS

= Hot Stabilized Idle Emission Rates from MOBILE4.1 Scenario (gm/hr)

ACCELERATION EMISSIONS

= MOBILE4.1 Scenario Rate * S * $\{0.018 - 5.266 \times 10^{-4} (AS) + 6.1296 \times 10^{-6} (AS)^2\}$ (gm/hr)

Figure 5.6 shows the variation of modal nitrogen oxide emissions with speed for the idle, cruise, and deceleration modes, as described by the models discussed above.

The MOBILE scenario rates for each speed were determined by running the MOBILE model for the scenario described in section 5.5 and for the required average route speed. As in the carbon monoxide model, to be consistent with the passenger car deceleration rate assumed in section 4.2 (g) of the previous chapter, the deceleration-speed product for the deceleration mode was assumed to be -130 ft²/s³, representing an average deceleration of 4.0 mph/s (6.0 ft/s²) between 0 and 30 mph.

Modal NOx Emission Rate Models



Figure 5.6. Plot of idle, cruise, and deceleration emission rate models for nitrogen oxides.

The acceleration model for nitrogen oxide emissions uses results from the MICRO2 model. The MICRO2 model uses correction factors to the composite MOBILE emission value as a function of the acceleration-speed product (AS). The resulting equation is presented below.

Accel. Emission Rate (gm/hr) = MOBILE Scenario Rate (gm/mi) * S (mph) * $\{(0.00386 + 8.1446 \times 10^{-4} (AS))\}$

Again, internally the MICRO2 model assumes a constant acceleration-speed product of 80.6667 ft^2/s^3 , representing an average acceleration of 2.5 mph/s between 0 and 30 mph. Figure 5.7 shows the variation of acceleration emissions with speed.





Figure 5.7. Plot of acceleration emission rate model for nitrogen oxides.

In summary, the modal nitrogen oxide emission rate models used for workzone mobile source emission prediction are shown in Table 5.4.

MOBILE4.1 SCENARIO DEFINITION

The emission rate models described in the sections before apply modal correction factors to the composite emission rates from the MOBILE model to arrive at the modal emission rates. The composite emission rates used in the QUEWZ model were obtained by running MOBILE4.1, which is the latest update in the MOBILE series of models. To run the MOBILE4.1 model, reasonable assumptions have to be made regarding input variables that influence emissions so that a representation of the workzone problem is achieved. Assumptions regarding each of these variables is discussed in this section and the runs made using the values ascribed to the variables constitute the MOBILE4.1 scenario rate mentioned in the previous sections.

TABLE 5.4. SUMMARY OF MODAL NITROGEN OXIDE MODELS USED FOR
WORKZONE MOBILE SOURCE EMISSION PREDICTION

MODAL NITROGEN OXIDE EMISSION RATE MODELS	
IDLE EMISSIONS = Hot Stabilized Idle Emission Rates from MOBILE4.1 Scenario (gm/hr)	
<u>DECELERATION EMISSIONS</u> = MOBILE4.1 Scenario Rate * S * {0.00143 - 1.7005x10 ⁻⁴ (AS)} (gm/hr)	
<u>CRUISE EMISSIONS</u> = Hot Stabilized Idle Emission Rates from MOBILE4.1 Scenario (gm/hr)	
ACCELERATION EMISSIONS = MOBILE4.1 Scenario Rate * S * {0.00386 + 8.1446x10 ⁻⁴ (AS)} (gm/hr)	

Average Route Speed

One important variable which has an influence over composite emission rates from MOBILE4.1 is the average route speed. The idle emission factors do not vary with the average route speed in the MOBILE4.1 model. Hence, the idle and deceleration emission rate models require only one run of the MOBILE4.1 routine in order to obtain the idle emission factor. The cruise emission rate model requires composite MOBILE4.1 emission factor at an average route speed of 16.2 mph for reasons stated in the discussion of the cruise emission rate model. The acceleration emission rate model, however, requires composite MOBILE4.1 emission factors for a range of average route speeds from 2.5 mph to 65 mph so that the composite emission factor for any desired average acceleration mode speed can be found by interpolation. Therefore, the MOBILE model needs to be run for a range of average route speeds to fulfill the requirements of all the modal emission rate models.

Vehicle Miles Traveled (VMT) Mix

The VMT mix determines the fraction of VMT accumulated by vehicles of each of the eight types, namely, light-duty gasoline vehicles (LDGV), light-duty gasoline trucks 1 (LDGT1), light-duty gasoline trucks 2 (LDGT2), heavy-duty gasoline vehicles (HDGV), light-duty diesel vehicles (LDDV), light-duty diesel trucks (LDDT), heavy-duty diesel vehicles (HDDV), and motorcycles. The model gives the composite emission factors for each of these vehicle types. The VMT mix is then used to obtain a single emission factor which applies to the vehicle fleet.

Since the workzone model deals only with two kinds of vehicles, namely passenger cars and trucks, the composite emission factors corresponding to LDGV's and HDDV's will be used to represent emissions from these two vehicle types. The assumed VMT mix does not affect these individual values. Hence, any VMT mix can be assumed for the MOBILE scenario run.

Annual Mileage Accumulation Rates and Registration Distributions

MOBILE4.1's emission factor calculations rely in part on travel fractions for vehicles of each given age and type, which in turn are based on estimates of the average annual mileage accumulation by age (first year to 25th-and-greater years of operation) for each of the eight vehicle types, and the registration distribution by age (age 0-1 to age 24-25+) for each vehicle type, except motorcycles, for which annual mileage accumulation rates and registration distributions are only provided for the 1st to 12th and later years of operation (ages 0-1 to 11-12+).

MOBILE4.1 uses national average annual mileage accumulation rates by age and registration distributions by age, and has provisions allowing the input of locality-specific data for either or both of these (Ref 16). The EPA strongly recommends the use of the annual mileage accumulation rates by age included in MOBILE4.1. The MOBILE4.1 runs for the workzone model make use of the annual mileage accumulation rates and registration distributions included in the model.

Operating Mode Mix

The operating mode fraction is an important determinant of vehicle emissions. Emissions data used in the MOBILE model are collected using the FTP test cycle, which is divided into three segments, namely, cold start segment, stabilized segment, and hot start segment. Data from each of these segments reflect the fact that emissions generally are highest when a vehicle is in the cold-start mode; the vehicle, engine, and emission control equipment (particularly the catalytic converter) are all at ambient temperature and thus not performing at optimum levels. Emissions are generally somewhat lower in the hot start mode, when the vehicle is not yet completely warmed up but was not sitting idle for sufficient time to have cooled completely to ambient temperature. Finally, emissions generally are lowest when the vehicle is operating in stabilized mode, and has been in continuous operation long enough for all systems to have attained relatively stable, fully "warmed-up" operating temperatures.

It is assumed that heavily traveled urban freeways will attract vehicle trips at a more or less constant rate over distances equal to the distance at which vehicles reach the end of operation in the cold start mode (Ref 10), provided competing freeways are not close by. Hence, for the workzone emission prediction problem, all vehicles are assumed to be operating in the hotstabilized mode.

Avg. Route	со	(gm/mi)	нс	(gm/mi)	NOx	(gm/mi)
Speed (mph)	Cars	Trucks	Cars	Trucks	Cars	Trucks
2.5	143.27	39.54	19.47	5.57	1.34	27.51
5.0	71.04	32.28	7.91	4.90	1.13	24.73
7.5	46.06	26.65	5.17	4.33	1.06	22.42
10.0	33.56	22.26	4.22	3.85	1.02	20.52
12.5	26.12	18.80	3.62	3.44	0.99	18.94
15.0	21.22	16.06	3.20	3.09	0.98	17.64
16.2	19.41	14.95	3.04	2.94	0.97	17.10
17.5	17.73	13.88	2.88	2.79	0.97	16.57
20.0	15.27	12.13	2.60	2.53	0.89	15.71
22.5	13.28	10.72	2.42	2.31	0.86	15.02
25.0	11.67	9.59	2.27	2.12	0.84	14.50
27.5	10.33	8.67	2.15	1.96	0.82	14.11
30.0	9.20	7.93	2.04	1.82	0.80	13.86
32.5	8.24	7.34	1.94	1.70	0.79	13.74
35.0	7.42	6.87	1.86	1.60	0.78	13.74
37.5	6.73	6.50	1.79	1.51	0.77	13.86
40.0	6.13	6.22	1.72	1.43	0.77	14.10
42.5	5.62	6.02	1.66	1.36	0.76	14.48
45.0	5.18	5.90	1.61	1.31	0.76	15.00
47.5	4.80	5.84	1.56	1.26	0.77	15.68
50.0	6.24	5.85	1.58	1.23	0.83	16.53
52.5	8.14	5.93	1.61	1.20	0.90	17.59
55.0	10.03	6.08	1.64	1.17	0.98	18.88
57.5	11.92	6.30	1.68	1.16	1.06	20.44
60.0	13.81	6.60	1.72	1.15	1.13	22.34
62.5	15.71	7.00	1.76	1.14	1.21	24.62
65.0	17.60	7.51	1.80	1.15	1.29	27.38
Idle Emissions	293.1 gm/h	51.18 gm/h	24.27 gm/h	17.37 gm/h	2.90 gm/h	22.32 gm/h

TABLE 5.5. SUMMARY OF MOBILE4.1 BASE SCENARIO RUNS

Low Altitude Region; 75°F Ambient Temperature; 100% Hot-Stabilized Mode.

Other Inputs

No inspection/maintenance program is assumed to be in operation. Also, emission rates are not corrected for air-conditioning usage, extra vehicle load, trailer towing, and humidity. No anti-tampering program is modeled.

Emissions calculations are performed for a low altitude region at an ambient temperature of 75°F for calendar year 1992.

A sample MOBILE4.1 input file and the output file for this base scenario have been included in Appendix A. A summary of the composite emission factors and the idle emission factors from the scenario runs for different average route speeds is shown in Table 5.5.

SUMMARY

This chapter discussed the general approaches that have been used in the past to obtain modal emission rate models. In addition, the modal models for each of the pollutants, namely, carbon monoxides, hydrocarbons, and nitrogen oxides, were described. The results obtained using these models, along with the output from the MOBILE program, were presented in the form of emission plots. The final step in the workzone emissions modeling process is the implementation of these models in the QUEWZ workzone traffic analysis package. This process is discussed in the next chapter.

CHAPTER 6. MODEL IMPLEMENTATION AND RESULTS

The incorporation of the modal emission rate models described in Chapter 5 into the methodology discussed in Chapter 3 constitutes the final step in the workzone emissions modeling process. This incorporation requires the correlation of the emission variables defined in Chapter 3 to the emission rate models discussed in Chapter 5.

In this chapter, we describe the implementation of the workzone emissions model in the QUEWZ program (Ref 7). This is followed by a discussion of the results obtained from the model and the use of the model in comparing different workzone strategies vis-`a-vis the environment.

IMPLEMENTATION

The methodology described in Chapter 3 for workzone mobile source emission prediction requires that the following emission rate values be evaluated:

- mpd = emission rate of pollutant p (p = carbon monoxides, hydrocarbons, or nitrogen oxides) emitted under deceleration at an average speed vd. (gm/sec/vehicle)
- mpai = emission rate of pollutant p (p = carbon monoxides, hydrocarbons, or nitrogen oxides) emitted under acceleration at an average speed v_{ai}. (gm/sec/vehicle)
- mpcri = emission rate of pollutant p (p = carbon monoxides, hydrocarbons, or nitrogen oxides) emitted while cruising at an average speed v_{cri}. (gm/sec/vehicle)
 - m_{pi} = mass of pollutant p (p = carbon monoxides, hydrocarbons, or nitrogen oxides) emitted while idling in the queue. (gm/sec/vehicle)

Using the emission rate models developed in the previous chapter, the following relations can be obtained for each of these pollutants and for both the vehicle types (i.e., passenger cars and trucks).

Carbon Monoxides

m_{COi} = Hot Stabilized Idle Emission Rates from the Default MOBILE4.1 (Ref 16) Scenario (gm/hr).

 $m_{COd} = 1.5 m_{COi}$

m_{COcri} = 16.2 mph MOBILE4.1 Scenario Rate * 16.2 * (0.494 + 0.000227 S²) (gm/hr) m_{COai} = MOBILE4.1 Scenario Rate at Speed V_{ai} * V_{ai} * {0.182 - 0.0079776 AS + 0.00036227 (AS)²} (gm/hr)

Hydrocarbons

^m HCi	=	Hot Stabilized Idle Emission Rates from the Default MOBILE4.1 Scenario	C
		(gm/hr).	

- ^mHCd ^{= m}HCi
- ^mHCcri ^{= m}HCi

 m_{HCai} = MOBILE4.1 Scenario Rate at Speed V_{ai} * V_{ai} * {0.018 - 5.266x10⁻⁴ (AS) + 6.1296x10⁻⁶ (AS)²} (gm/hr)

Nitrogen Oxides

^m NOxi	=	Hot Stabilized Idle Emission Rates from the Default MOBILE4.1 Scenario
		(gm/hr).

- m_{NOxd} = MOBILE4.1 Scenario Rate at Speed V_d * V_d * {0.00143 1.7005x10⁻⁴ (AS)} (gm/hr)
- m_{NOxcri} = Hot Stabilized Idle Emission Rates from MOBILE4.1 Scenario (gm/hr)

 m_{NOxai} = MOBILE4.1 Scenario Rate at Speed V_{ai} * V_{ai} * {0.00386 + 8.1446x10⁻⁴ (AS)} (gm/hr)

The acceleration and deceleration emission rate equations shown above are taken from the MICRO2model (Ref 22). As mentioned in Chapter 5, the MICRO2 model uses a constant value for the acceleration-speed product in these equations. The acceleration and deceleration values assumed for the workzone model and the AS values used for passenger cars and trucks are shown in Table 6.1.

TABLE 6.1. ACCELERATION-SPEED PRODUCT (AS) FOR PASSENGER CARS AND TRUCKS

	Accel. Rates	(ft/s^2)	AS (sq. ft.	/ cu. sec.)
MODE	Pass. Cars	Trucks	Pass. Cars	Trucks
Acceleration	4.5	1.6	97.0	35.0
Deceleration	-6.0	-2.2	-130.0	-48.5

The other inputs that are required for implementing these models include:

- the MOBILE4.1 scenario hot-stabilized idle emission rates,
- the 16.2 mph MOBILE4.1 scenario rate for carbon monoxide, and
- the MOBILE4.1 scenario rate for speeds ranging from 0 to 65 mph for all pollutants.

The default MOBILE4.1 scenario for obtaining these inputs was defined in the previous chapter; the values of these inputs for this default scenario were shown in Table 5.5. Correction factors to be applied for scenarios other than the default scenario are discussed in the next section.

All the modal emission rate equations discussed in Chapter 5 are either assumed to be constants, or are functions of speed, except for the acceleration and deceleration emission rate models, some of which are functions of the MOBILE4.1 scenario rate also. This implies that the MOBILE model will have to be run for each speed at which acceleration and deceleration emissions are required. For ease of implementation of these models in QUEWZ, however, it is necessary to make these acceleration and deceleration emission rate models independent of the MOBILE4.1 scenario rate. Using these equivalent models, the emission rate can be determined given the speed of the vehicle in the acceleration or deceleration zone without having to run the MOBILE4.1 model to obtain the scenario rate for that speed. As an example, the equivalent emission rate model for emission of carbon monoxides under acceleration is derived here.

The emission rate model for emission of carbon monoxides under acceleration is as follows:

m_{COai} = MOBILE4.1 Scenario Rate * S * {0.182 - 0.0079776 AS + 0.00036227 (AS)²} (gm/hr)

From Table 6.1., the acceleration speed product, AS for passenger cars is 97 ft^2/s^3 . Using this value gives the following result for m_{COai}.

m_{COai} = MOBILE4.1 Scenario Rate * S * 2.816

The MOBILE4.1 default scenario rates for different speeds ranging from 2.5 mph to 65 mph were shown in Table 5.5. Multiplying these values by the corresponding speeds and by the factor of 2.816, a range of values m_{COai} are obtained for different speeds. Regressing these values against speed gives the following equivalent model for the emission rate of carbon monoxides under acceleration (passenger cars):

 m_{COai} = 1011.4 - 9.0*S + 0.804*S² - 0.04903*S³ + 0.000729*S⁴ (gm/hr).
The original model and the regressed equivalent model are shown in Figure 6.1. Similar equivalent models are obtained for emission rates of CO, HC, and NO_{χ} under acceleration and deceleration, both for passenger cars and trucks. These equivalent regression models are included in Appendix B.



Figure 6.1. Equivalent CO emission rate model under acceleration.

These equivalent models have been formulated for their ease of implementation in QUEWZ and do not have any physical significance. These models derive their physical significance from the original models in the MICRO2 program. As discussed in Chapter 5, the MICRO2 model gives the emission rates in terms of the acceleration speed product, which is related to power per unit mass and hence to emissions.

CORRECTION FACTORS

The default scenario which was used to obtain the required MOBILE4.1 outputs was described in the previous chapter. The main elements of this default scenario are as follows :

- A low altitude region is modeled,
- An ambient temperature of 75°F is used,
- All vehicles are assumed to be operating in a hot stabilized mode,
- No anti-tampering program is in effect,

- No inspection/maintenance program is in effect, and
- MOBILE4.1 default vehicle age distributions are used.

To model scenarios other than this default scenario, correction factors need to be applied to the emission rate equations used in the workzone model. Correction factors based solely on the differences between idle emissions in the default scenario versus the actual scenario being modeled are used in the emissions model. The following correction factors k_1 , k_2 , ..., k_6 are used in the model depending on the type of pollutant and the type of vehicle :

Carbon Monoxide

		Idle CO Emission Rate for Cars in the Actual Scenario	
K1	=	Idle CO Emission Rate for Cars in the Default Scenario	

1.		Idle CO Emission Hate for Trucks in the Actual Scenario
^K 2	==	Idle CO Emission Rate for Trucks in the Default Scenario

Hydrocarbons

kз	=	Idle HC Emission Rate for Cars in the Actual Scenario Idle HC Emission Rate for Cars in the Default Scenario
k ₄	, =	Idle HC Emission Rate for Trucks in the Actual Scenario Idle HC Emission Rate for Trucks in the Default Scenario

Nitrogen Oxides

1.		Idle NO _x Emission Rate for Cars in the Actual Scenario
к5	=	Idle NO _X Emission Rate for Cars in the Default Scenario
1.		Idle NO_X Emission Rate for Trucks in the Actual Scenario
к6	=	Idle NO _x Emission Rate for Trucks in the Default Scenario

Appendices C and D summarize all the modal emission rate models, for passenger cars and trucks respectively, used for implementing the workzone emission prediction model on the QUEWZ package.

THE QUEWZEE PROGRAM

The methodologies and models described in the preceding chapters were implemented in the QUEWZ program. The revised version of the QUEWZ model is called QUEWZEE, indicating the additional capabilities of predicting energy values and emission values. The emission model was appended as a separate file independent of the QUEWZ program. Changes were made in the original QUEWZ program only for the purposes of reading input data and writing the output file. The source code for the emissions procedure of the QUEWZEE program is included in Appendix E.

The only additional inputs needed by the program for emissions calculation are the hot stabilized idle emission rates of CO, HC, and NO_X for passenger cars and trucks for the scenario being modeled.

The program gives an output of the carbon monoxide, hydrocarbon, and nitrogen oxide emissions for each hour that the workzone is in operation. In addition, the total daily excess emissions of these pollutants is output by the program.

ILLUSTRATIVE EXAMPLES

In order to test the model and to illustrate its use, eight sample workzone problems were analyzed. All the sample problems use an ADT of 25,000 vehicles in each direction of the freeway. The original number of lanes, number of open lanes at the workzone, workzone length, and workzone activity period were the various parameters in these sample problems. Table 6.2 summarizes the characteristics of these problems and the corresponding results from the QUEWZEE model. Appendix F contains the complete outputs for each of these problems.

The general behavior of the emission values is the same as those of the user costs and energy values. As can be seen from Table 6.2, queuing significantly affects the excess emissions created in the workzone.

An important application of this model is in choosing between different workzone traffic management strategies. Choosing between the strategy in test problem 5 and the strategy in test problem 7 is an example of this application. The required construction work can be performed on the roadway by either closing two lanes at the same time or by closing one lane at a time and working for twice the period of time. The excess emissions due to the closure of two lanes at the same time is more than double the excess emissions from the closure of one lane at a time. In a similar manner, comparisons between various strategies can be made to arrive at optimal workzone configurations and work schedules.

Another application of this model would be in the analysis of the workzone and the elements affected by it as a system. Such a systems approach for the analysis of a workzone has been recently proposed (Ref 6). Given a major freeway or highway reconstruction or rehabilitation project, the analysis would take into account the agency costs, the business costs, the road user costs, the environmental costs, and costs to other parties (e.g., utility companies). The construction strategy that leads to a minimum system cost would then be chosen. The workzone emissions prediction model will be helpful in quantifying the environmental impacts of each strategy being considered. The results can be used as leverage for construction strategies that make use of expediting techniques.

Prob.	No. of	No. of	WZ	Normal	Restricted V	VZ Capacity	Hours of	of Restr.	Hours	of WZ	Longest	То	tal Emissio	ons
No.	Lanes	Open	Length	Capacity	Inactivity	Activity	Сар	acity	Act	ivity	Queue	00	нс	NOx
		Lanes	(mi)	(vph)	Hrs. (vph)	Hrs. (vph)	Beg.	End	Beg.	End	(mi)	(Kgs)	(Kgs)	(Kgs)
1	2	1	1.0	4000	1800	1485	8	17	9	16	0.8	96.5	9.1	2.0
2	2	1	2.0	4000	1800	1485	8	17	9	16	0.8	101.7	11.7	2.6
3	2	1	1.0	4000	1800	1485	0	24	9	16	2.2	449.1	42.3	9.6
4	2	1	2.0	4000	1800	1485	0	24	9	16	2.2	464.5	48.5	11.1
5	3	2	1.0	6000	3600	2970	8	17	9	16	0.0	6.7	0.2	0.0
6	3	2	2.0	6000	3600	2970	8	17	9 g	16	0.0	6.4	0.4	0.1
7	3	1 - 1	1.0	6000	1800	1250	8	17	9	16	1.6	449.2	42.6	9.7
8	3	1	2.0	6000	1800	1250	8	17	9	16	1.6	459.1	46.9	10.8

TABLE 6.2. SUMMARY OF INPUTS TO AND OUTPUTS FROM THE TEST PROBLEMS

To illustrate the enormous impact that can be caused by workzones on freeways, we now provide an estimate of the excess emissions generated by workzones at reconstruction and rehabilitation sites on the nation's deficient bridge infrastructure.

The work done by Weissmann and Harrison (Ref 47) to predict user costs for similar purposes is used as the basis for this analysis. Only bridges with high traffic levels (defined by an ADT > 20,000) were considered in their analysis. Bridges with ADT between 20,000 and 30,000 were assumed to be two lanes one way, with one lane closed during work. Bridges with ADT between 30,000 and 45,000 were assumed to be three lanes one way, with two lanes closed and one lane of traffic from the bridge under construction being switched to run counterflow in the closed inside lane. Bridges with ADT greater than 45,000 were assumed to be four lanes one way, with two lanes closed during work. There were 524 deficient bridges of the two-lane kind, 297 deficient bridges of the three-lane kind, and 363 deficient bridges of the four-lane kind identified in the study. The total user costs during reconstruction work on these bridges were calculated to be approximately \$6 billion.

A similar analysis is performed for the emission of carbon monoxides, hydrocarbons, and nitrogen oxides. Results of the analysis of these bridges using QUEWZEE are shown in Table 6.3.

ADT	No. of Lanes ¹	No. of Def. Bridges	CO/day/ Bridge (kgs)	HC/day/ Bridge (kgs)	NOx/day /Bridge (kgs)	Total ² CO Em. (tons)	Total ² HC Em. (tons)	Total ² NOx Em. (tons)
> 20,000 < 30,000	2	524	70.6	6.4	1.4	11098.32	1006.08	220.08
> 30,000 < 45,000	3 ³	297	41.8	2.0	0.4	3724.38	178.20	35.64
> 45,000	4	363	493.3	46.6	10.9	53720.37	5074.74	1187.01
Totals		1184				68543.07	6259.02	1442.73

TABLE 6.3. PREDICTED EMISSIONS USING QUEWZEE MODEL

1 One lane closed for 2-lane capacity, two lanes for 4-lane capacity.

2 Total Emissions assume a 300-day contract cycle per structure.

3 Construction first rehabilitates two lanes, then the third. Two lanes always open to traffic. When only one lane is open, the matching bridge is opened to diverted traffic and both bridges are reduced to two lane travel.

The predicted carbon monoxide emissions total to 68,543 tons, hydrocarbon emissions total to 6,259 tons, and nitrogen oxide emissions total to 1,443 tons. As noted by Weissmann and Harrison, this figure is conservative, since it relates only to a subset of the rural bridge population and uses a truck ADT of 14 percent, which is lower than most interstate values.

The results presented above give an indication of the magnitude of the emissions problem at workzones.

SUMMARY

The implementation of the workzone mobile source emission prediction model was discussed in this chapter. In addition, the use of correction factors to model scenarios other than the default scenario was described. The idle emission factors for the actual scenario will be required as inputs to QUEWZEE to apply these correction factors. The main features of the QUEWZEE model were explained and some applications of the model were described. The magnitude of the emissions problem at workzones was illustrated using workzones associated with nationwide reconstruction of deficient bridges.



CHAPTER 7. CONCLUSIONS AND RECOMMENDATIONS

As mentioned in the introduction, many of the nation's heavily traveled urban freeways are being reconstructed or rehabilitated, with such construction activities most often introducing negative impacts to the surrounding environment. Included among these negative impacts are the excess vehicle emissions generated within roadway workzones. If planners could predict these excess emissions, then they would be able to compare different workzone traffic management strategies based on the predicted values. The workzone mobile source emission prediction model developed in this study provides a means for making such comparisons.

The report authors pursued this prediction model according to the following objectives:

- review and evaluate current techniques and models used for the prediction of emissions from mobile sources,
- develop a methodology for the quantification of mobile source emissions at workzones based on the above review,
- · validate the methodology and implement it as a computer model, and
- illustrate the applications of the computer model to workzone problems.

The preceding chapters have detailed the manner in which these objectives were attained. Specifically, the report detailed (1) the four steps involved in a comprehensive mobile source pollution modeling process; (2) the traffic modeling and source strength determination processes; and (3) the use of QUEWZ for modeling workzone emissions.

The study succeeded in developing QUEWZEE, a computer model that is capable of predicting mobile source emissions at freeway workzones. These predictions are based on the characteristics of the workzone (e.g., configuration and schedules), the characteristics of traffic at the workzone (such as volume, percent trucks, etc.), and the emissions characteristics of vehicles in the area. The model gives the excess emission values for two vehicle types and three pollutant types.

The model can be used for comparing the environmental aspects of construction and traffic management strategies for the workzone. Moreover, the results from the model can be used as leverage towards expedited construction strategies that help in reducing air pollution. The magnitude of the emissions problem at workzones was illustrated using workzones at deficient bridge reconstruction sites in the United States.

The model cannot, however, take into account the diversion of traffic away from the workzone caused by the formation of long queues. When queues develop upstream of the workzone, traffic diverts to frontage roads or to other parallel routes. Hence, the traffic volume passing through the workzone is less than what might ordinarily be expected. Further research is needed to quantify the nature of this traffic diversion. Currently, the traffic distribution input into the model needs to account for the amount of traffic that diverts to avoid the workzone.

The lack of accurate, validated models that characterize modal emissions from vehicles was underscored throughout this study. As new data and modal emission rate models become available, the QUEWZEE model can be easily updated to incorporate the new findings.

The increase in truck traffic on freeways has resulted in an increase in particulate emissions. The nature of these emissions needs to be explored in greater detail. Collection of particulate emissions data and quantification of the emissions by mode of operation is another area for future work.

Finally, while making enhancements to the emissions model, the trade-off between increasing the accuracy of the emission rate models and the discrimination that is reflected in the results needs to be considered.

REFERENCES

- 1. Homburger, W. S., and J. H. Kell, *Fundamentals of Traffic Engineering*, 12th ed., Institute of Transport Studies, Univ. of California, Berkeley, UCB-ITS-CN-88-1, 1989.
- 2. South Coast Air Quality Management District, The Path to Clean Air: Attainment Strategies, Southern California Association of Governments, El Monte, California, 1989, p.10.
- 3. U.S. Environmental Protection Agency, National Air Pollutant Emission Estimates, 1940-1982, Research Triangle Park, NC: Report EPA-450/4-83-024, Feb. 1984.
- 4. Southern California Association of Governments, Regional Mobility Plan, 1989, Los Angeles, California, 1989, p. I-2.
- 5. Cameron, M., "Transportation Efficiency: Tackling Southern California's Air Pollution and Congestion," Environmental Defense Fund, Regional Institute of Southern California, March 1991.
- 6. de Solminihac, H., "Systems Analysis for Expediting Urban Highway Construction," doctoral dissertation, The University of Texas at Austin, Austin, Texas, 1992.
- Memmott, J. L., and C. L. Dudek, "A Model to Calculate the Road User Costs at Work Zones," Research Report 292-1, Texas Transportation Institute, Texas A&M University, College Station, Texas, 1981.
- Marks, C., and G. Niepoth, "Car Design for Economy and Emissions," Automotive Fuel Economy, Warrendale, PA: Society of Automotive Engineers, Progress in Technology Series, v.15, 1976. pp. 134-158.
- 9. Pasquill, F., and F. B. Smith, Atmospheric Diffusion, 3rd ed., Ellis Horwood Ltd., John Wiley & Sons, 1983.
- Benson, P. E., "CALINE4-A Dispersion Model for Predicting Air Pollutant Concentrations Near Roadways, Final Report," FHWA/CA/TL-84/15, California Dept. of Transportation, Sacramento, CS, 1984.
- Petersen, W. B., "User's Guide for HIWAY-2, a Highway Air Pollution Model," EPA-600/8-80-018, PB80-227556, U.S. Environmental Protection Agency Environmental Sciences Research Laboratory, Research Triangle Park, NC, 1980.
- 12. Kunselman, P., H. T. McAdams, C. J. Domke, and M. E. Williams, "Automobile Exhaust Emission Modal Analysis Model," EPA-460/3-74-005, U.S. EPA Office of Mobile Source Air Pollution Control, Ann Arbor, 1974.
- 13. U.S. EPA Office of Air, Noise, and Radiation, "User's Guide to MOBILE1 (Mobile Source Emissions Model)," EPA-400/9-78-007, Washington, D.C., 1978.
- 14. U.S. EPA Office of Mobile Source Air Pollution Control, "User's Guide to MOBILE2 (Mobile Source Emissions Model)," EPA-460/3-81-006, Ann Arbor, 1981.
- 15. U.S. EPA Motor Vehicle Emissions Laboratory, "User's Guide to MOBILE3 (Mobile Source Emissions Model)," EPA-460/3-84-002, Ann Arbor, 1984.
- 16. U.S. EPA Motor Vehicle Emissions Laboratory, "User's Guide to MOBILE4.1 (Mobile Source Emissions Model)," EPA-AA-TEB-91-01, Ann Arbor, 1991.
- 17. Weaving, J. H. (ed.), Internal Combustion Engineering: Science and Technology, Elsevier Applied Science, 1990.
- 18. Sculley, R. D., "Vehicle Emission Rate Analysis for Carbon Monoxide Hot Spot Modeling," *Journal of Air Pollution Control Association*, v.39, 1989.
- 19. U.S. Government, Code of Federal Regulations, Title 40, Part 86, Appendix I, 1986.

- U.S. Environmental Protection Agency Office of Mobile Sources, "Compilation of Air Pollutant Emission Factors, Volume II: Mobile Sources, Fourth Edition," AP-42, Ann Arbor, MI, 1985.
- U.S. Environmental Protection Agency, "Carbon Monoxide Hot Spot Guidelines, Volume V: User's Manual for the Intersection-Midblock Model," EPA-450/3-78-037, Research Triangle Park, NC, 1978.
- 22. Griffin, R. G., "MICRO2-an Air Quality Intersection Model, Final Report," FHWA/CO/RD-83/14, PB85-219202, Colorado Dept. of Highways, Denver, CO, 1983.
- Bullin, J. A., J. J. Korpics, and M. W. Hlavinka, "User's Guide to the TEXIN2 Model-A Model for Predicting Carbon Monoxide Concentrations Near Intersections," Texas Transportation Institute Research Report 283-2, Texas A&M University, College Station, TX, 1986.
- 24. Dickey, P., "Lake Tahoe High Altitude Vehicle Surveillance Program," California Air Resources Board, Project T, December 1976.
- Rutherford, J. A., "Automobile Exhaust Emission Surveillance Analysis of the FY 1975 Program," U.S. Environmental Protection Agency, EPA-460/3-77-022, December 1977.
- 26. Lewis, R. M., "Work Zone Traffic Control Concepts and Terminology," Transportation Research Record 1230, 1989, pp. 1-11.
- 27. Kermode, R. H. and W. A. Myyra, "Freeway Lane Closures," Traffic Engineering, Vol 40, No. 5, 1970, pp. 14-18.
- Dudek, C. L. and S. H. Richards, "Traffic Capacity Through Work Zones on Urban Freeways," Research Report 228-6, Texas Transportation Institute, Texas A&M University, College Station, Texas, 1981.
- 29. Transportation Research Board, Highway Capacity Manual, Special Report 209, Washington D.C., 1985, pp.
- 30. Dudash, R. E., and A. Bullen, "Single-Lane Capacity of Urban Freeway during Reconstruction," Transportation Research Record 905, 1983, pp. 115-117.
- 31. Zhang, J., L. Leiman, and A. D. May, "Evaluation of Operational Effects of Freeway Reconstruction Activities," Transportation Research Record, 1989, pp. 27-39.
- 32. Highway Research Board, National Academy of Sciences, Highway Capacity Manual, Washington D.C., 1965.
- 33. Texas Department of Highways and Public Transportation, Programmer's Supplement to Highway Economic Evaluation Model, Austin, Texas, 1976.
- Krammes, R. A., C. L. Dudek, and J. L. Memmott, "Computer Model for Evaluating and Scheduling Freeway Work Zone Lane Closures," Transportation Research Record 1148, 1987, pp. 18-24.
- 35. Butler, Jr., B. C., *Economic Analysis of Roadway Occupancy for Freeway Pavement Maintenance and Rehabilitation*, Vol. 2, Report FHWA-RD-76-14, Virginia, 1974.
- 36. Abrams, C. M., and J. J. Wang, "Planning and Scheduling Work Zone Traffic Control," Report FHWA-IP-81-6, JHK & Associates, California, 1981.
- 37. Rouphail, N. M. and G. Tiwari, "Flow Characteristics at Freeway Lane Closures," Transportation Research Record 1035, 1985, pp. 50-58.
- Richards, S. H., and C. L. Dudek, "Sight Distance Requirements at Lane Closure Work Zones on Urban Freeways," Research Report 228-7, Texas Transportation Institute, Texas A&M University, College Station, Texas, 1981.

- 39. Nemeth, Z.A. and Rouphail, N.M., "Lane Closures at Freeway Work Zones: Simulation Study", Transportation Research Record 869, 1982, pp. 19-25.
- Messer, C.J. and Dudek, C.L., Development of a Model for Predicting Travel Time on an Urban Freeway, Research Report 165-8, Texas Transportation Institute, Texas A&M University, College Station, Texas, 1974.
- 41. American Association of State Highway and Transportation Officials, A Policy on Geometric Design of Highways and Streets, AASHTO, 1990.
- 42. Homburger, W. S. (ed.), Transportation and Traffic Engineering Handbook, Institute of Transportation Engineers, 2nd edition, Prentice-Hall, Inc., 1982, pp. 168.
- 43. Lee, C. E., T. W. Rioux, and C. R. Copeland, Jr., "The TEXAS Model for Intersection Traffic - Development," Center for Transportation Research, Report No. 184-1, The University of Texas at Austin, Austin, TX, December 1977.
- Lee, C. E., and F. Lee, "Simulation of Traffic Performance, Vehicle Emissions, and Fuel Consumption at Intersections: The TEXAS-II Model," Transportation Research Record 971, Transportation Research Board, Washington, D.C., 1984.
- 45. Storment, J. O., and K. J. Springer, "A Surveillance Study of Smoke from Heavy-Duty Diesel-Powered Vehicles in Southwestern U.S.A.," Southwest Research Institute, Contract No. EHS 70-109, EPA, San Antonio, TX, June 1973.
- 46. Griffin, R. G., "Air Quality Impact of Signaling Decisions," CDOH-DTP-R-80-12, FHWA-CO-RD-80-12, Colorado Department of Highways, Denver, CO, 1980.
- 47. Weissmann, J., and R. Harrison, "Impact of Turnpike Doubles and Triple 28s on the Rural Interstate Bridge Network," Transportation Research Record 1319, TRB, National Research Council, Washington, D.C., 1991.



APPENDIX A: DEFAULT SCENARIO RUNS OF THE

MOBILE4.1 MODEL



***** BASE SCENARIO RUNS OF MOBILE4.1 FOR 75F AMBIENT TEMP. ***** Total HC emission factors include evaporative HC emission factors.

Cal. Year:	1992		Region	: Low		Altit	ude: 5	500. Ft.		
		I/M	Program	: No	Ал	bient T	emp:	75.0 /	75.0 /	75.0 F
	Ant	ti-tam.	Program	: No	Oper	ating M	ode:	0.0 /	0.0 /	0.0
2.5 mph 75F	0%CS									
		Minin	num Temp	: 59.	(F) Ma	ximum T	emp: 91	l. (F)		
		Perio	od 1 RVP	: 11.5	Pe	riod 2	RVP: 11	l.5 Peri	od 2 Y	r: 1988
Veh. Type:	LDGV	LDGT1	LDGT2	LDGT	HDGV	LDDV	LDDT	HDDV	MC	All Veh
Veh. Spd.:	2.5	2.5	2.5		2.5	2.5	2.5	2.5	2.5	
VMT Mix:	0.870	0.000	0.000		0.000	0.000	0.000	0.130	0.000	
Composite E	mission	n Factor	rs (Gm/M	ile)						
Total HC:	19.91	22.86	30.97	0.00	46.08	1.44	1.93	5.57	13.65	18.04
Exhst HC:	7.08	10.17	14.04	0.00	16.60	1.44	1.93	5.57	9.71	6.88
Evap. HC:	1.20	1.29	2.17	0.00	6.42				3.48	1.04
Refuel HC:	0.00	0.00	0.00	0.00	0.00					0.00
Runing HC:	11.52	11.31	14.66	0.00	22.93					10.02
Rsting HC:	0.11	0.09	0.10	0.00	0.13				0.46	0.10
Exhst CO:1	43.27	0.00	0.00	0.00	0.00	0.00	0.00	39.54	0.00	129.79
Exhst NOX:	1.34	0.00	0.00	0.00	0.00	0.00	0.00	27.51	0.00	4.74
Hot Stabili	zed Id	le Emiss	sion Fac	tors (Gm/Hr)					
Idle HC:	24.27	0.00	0.00	0.00	0.00	0.00	0.00	17.37	0.00	23.37
Idle CO:2	93.10	0.00	0.00	0.00	0.00	0.00	0.00	51.18	0.00	261.65
Idle NOX:	2.90	0.00	0.00	0.00	0.00	0.00	0.00	22.32	0.00	5.43
Contraction of the local division of the loc										
Cal. Year:	1992		Region	: Low		Altit	ude: 5	500. Ft.		
Cal. Year:	1992	I/M	Region Program	: Low	Ал	Altit bient T	ude: 5 emp:	500. Ft. 75.0 /	75.0 /	75.0 F
Cal. Year:	1992 Ant	I/M ti-tam.	Region Program Program	: Low : No : No	Am Oper	Altit bient T ating M	ude: 5 emp: ode:	500. Ft. 75.0 / 0.0 /	75.0 / 0.0 /	75.0 F 0.0
Cal. Year: 5.0 mph 75F	1992 Ant 0%CS	I/M ti-tam.	Region Program Program	: Low : No : No	Am Oper	Altit bient T ating M	ude: 5 emp: ode:	500. Ft. 75.0 / 0.0 /	75.0 / 0.0 /	75.0 F 0.0
Cal. Year: 5.0 mph 75F	1992 Ant 0%CS	I/M ti-tam. Minin	Region Program Program mum Temp	: Low : No : No : 59.	Am Oper (F) Ma	Altit bient T ating M ximum T	ude: 5 emp: ode: emp: 9	500. Ft. 75.0 / 0.0 /	75.0 / 0.0 /	75.0 F 0.0
Cal. Year: 5.0 mph 75F	1992 Ant 0%CS	I/M ti-tam. Minin Perio	Region Program Program mum Temp od 1 RVP	: Low : No : No : 59. : 11.5	Am Oper (F) Ma Pe	Altit bient T ating M ximum T riod 2	ude: 5 emp: ode: emp: 9 RVP: 1	500. Ft. 75.0 / 0.0 / 1. (F) 1.5 Peri	75.0 / 0.0 /	75.0 F 0.0 r: 1988
Cal. Year: 5.0 mph 75F Veh. Type:	1992 Ant 0%CS LDGV	I/M ti-tam. Minim Perio LDGT1	Region Program Program mum Temp od 1 RVP LDGT2	:: Low :: No :: No :: 59. :: 11.5 LDGT	Am Oper (F) Ma Pe HDGV	Altit bient T ating M ximum T riod 2 LDDV	ude: 5 emp: ode: emp: 9 RVP: 1 LDDT	500. Ft. 75.0 / 0.0 / 1. (F) 1.5 Peri HDDV	75.0 / 0.0 / iod 2 Y MC	75.0 F 0.0 r: 1988 All Veh
Cal. Year: 5.0 mph 75F Veh. Type: Veh. Spd.:	1992 Ani 0%CS LDGV	I/M ti-tam. Minim Perio LDGT1 5.0	Region Program Program mum Temp od 1 RVP LDGT2 5.0	:: Low :: No :: No :: 59. : 11.5 LDGT	Am Oper (F) Ma Pe HDGV 5.0	Altit bient T ating M ximum T riod 2 LDDV 5.0	ude: 5 emp: ode: emp: 9' RVP: 1' LDDT	500. Ft. 75.0 / 0.0 / 1. (F) 1.5 Peri HDDV 5.0	75.0 / 0.0 / iod 2 Y MC	75.0 F 0.0 r: 1988 All Veh
Cal. Year: 5.0 mph 75F Veh. Type: Veh. Spd.: VMT Mix:	1992 Ani 0%CS LDGV 5.0 0.870	I/M ti-tam. Minim Perio LDGT1 5.0 0.000	Region Program Program mum Temp od 1 RVP LDGT2 5.0 0.000	:: Low :: No :: No :: 59. :: 11.5 LDGT	Am Oper (F) Ma Pe HDGV 5.0 0.000	Altit bient T ating M ximum T riod 2 LDDV 5.0 0.000	ude: 5 emp: ode: emp: 9' RVP: 1' LDDT 5.0 0.000	500. Ft. 75.0 / 0.0 / 1. (F) 1.5 Peri HDDV 5.0 0.130	75.0 / 0.0 / iod 2 Y MC 5.0 0.000	75.0 F 0.0 r: 1988 All Veh
Cal. Year: 5.0 mph 75F Veh. Type: Veh. Spd.: VMT Mix: Composite E	1992 Ani 0%CS LDGV 5.0 0.870 mission	I/M ti-tam. Minim Perio LDGT1 5.0 0.000 Factor	Region Program Program mum Temp od 1 RVP LDGT2 5.0 0.000 rs (Gm/M	: Low : No : S9. : 11.5 LDGT	Am Oper (F) Ma Pe HDGV 5.0 0.000	Altit bient T ating M ximum T riod 2 LDDV 5.0 0.000	ude: 5 emp: ode: emp: 9' RVP: 1' LDDT 5.0 0.000	500. Ft. 75.0 / 0.0 / 1. (F) 1.5 Peri HDDV 5.0 0.130	75.0 / 0.0 / iod 2 Y MC 5.0 0.000	75.0 F 0.0 r: 1988 All Veh
Cal. Year: 5.0 mph 75F Veh. Type: Veh. Spd.: VMT Mix: Composite E Total HC:	1992 Ani 0%CS LDGV 5.0 0.870 mission 8.34	I/H ti-tam. Minim Perio LDGT1 5.0 0.000 n Factor 10.14	Region Program Program Mum Temp od 1 RVP LDGT2 5.0 0.000 rs (Gm/M 13.89	: Low : No : S9. : 11.5 LDGT ile) 0.00	Am Oper (F) Ma Pe HDGV 5.0 0.000 25.77	Altit bient T ating M ximum T riod 2 LDDV 5.0 0.000 1.27	ude: 5 emp: ode: emp: 9' RVP: 1' LDDT 5.0 0.000 1.70	500. Ft. 75.0 / 0.0 / 1. (F) 1.5 Peri HDDV 5.0 0.130 4.90	75.0 / 0.0 / iod 2 Y MC 5.0 0.000 9.99	75.0 F 0.0 r: 1988 All Veh 7.90
Cal. Year: 5.0 mph 75F Veh. Type: Veh. Spd.: VMT Mix: Composite E Total HC: Exhst HC:	1992 Ant 0%CS LDGV 5.0 0.870 6.34 3.77	I/M ti-tam. Minim Perio LDGT1 5.0 0.000 Factor 10.14 5.57	Region Program Program mum Temp dd 1 RVP LDGT2 5.0 0.000 rs (Gm/M 13.89 7.63	: Low : No : S9. : 11.5 LDGT ile) 0.00 0.00	Ат Орег (F) Ма Ре HDGV 5.0 0.000 25.77 13.23	Altit bient T ating M ximum T riod 2 LDDV 5.0 0.000 1.27 1.27	ude: 5 emp: ode: emp: 9' RVP: 1' LDDT 5.0 0.000 1.70 1.70	500. Ft. 75.0 / 0.0 / 1. (F) 1.5 Peri HDDV 5.0 0.130 4.90 4.90	75.0 / 0.0 / fod 2 Y MC 5.0 0.000 9.99 6.05	75.0 F 0.0 r: 1988 All Veh 7.90 3.92
Cal. Year: 5.0 mph 75F Veh. Type: Veh. Spd.: VMT Mix: Composite E Total HC: Exhst HC: Evap. HC:	1992 Ant 0%CS LDGV 5.0 0.870 6.34 3.77 1.20	I/M ti-tam. Minim Perio LDGT1 5.0 0.000 Factor 10.14 5.57 1.29	Region Program Program mum Temp od 1 RVP LDGT2 5.0 0.000 rs (Gm/M 13.89 7.63 2.17	: Low : No : S9. : 11.5 LDGT ile) 0.00 0.00 0.00	Ат Орег (F) Ма Ре HDGV 5.0 0.000 25.77 13.23 6.42	Altit bient T ating M ximum T riod 2 LDDV 5.0 0.000 1.27 1.27	ude: 5 emp: ode: emp: 9' RVP: 1' LDDT 5.0 0.000 1.70 1.70	500. Ft. 75.0 / 0.0 / 1.5 Peri HDDV 5.0 0.130 4.90 4.90	75.0 / 0.0 / iod 2 Y MC 5.0 0.000 9.99 6.05 3.48	75.0 F 0.0 r: 1988 All Veh 7.90 3.92 1.04
Cal. Year: 5.0 mph 75F Veh. Type: Veh. Spd.: VMT Mix: Composite E Total HC: Exhst HC: Evap. HC: Refuel HC:	1992 Ant 0%CS LDGV 5.0 0.870 mission 8.34 3.77 1.20 0.00	I/M ti-tam. Minim Perio LDGT1 5.0 0.000 Factor 10.14 5.57 1.29 0.00	Region Program Program mum Temp od 1 RVP LDGT2 5.0 0.000 rs (Gm/M 13.89 7.63 2.17 0.00	: Low : No : S9. : 11.5 LDGT ile) 0.00 0.00 0.00 0.00	Ат Орег (F) Ма Ре HDGV 5.0 0.000 25.77 13.23 6.42 0.00	Altit bient T ating M ximum T riod 2 LDDV 5.0 0.000 1.27 1.27	ude: 5 emp: ode: emp: 9' RVP: 1' LDDT 5.0 0.000 1.70 1.70	500. Ft. 75.0 / 0.0 / 1.5 Peri HDDV 5.0 0.130 4.90 4.90	75.0 / 0.0 / iod 2 Y MC 5.0 0.000 9.99 6.05 3.48	75.0 F 0.0 r: 1988 All Veh 7.90 3.92 1.04 0.00
Cal. Year: 5.0 mph 75F Veh. Type: Veh. Spd.: VMT Mix: Composite E Total HC: Exhst HC: Evap. HC: Refuel HC: Runing HC:	1992 Anti 0%CS LDGV 5.0 0.870 6.34 3.77 1.20 0.00 3.26	I/H ti-tam. Minim Perio LDGT1 5.0 0.000 Factor 10.14 5.57 1.29 0.00 3.18	Region Program Program mum Tempod 1 RVP LDGT2 5.0 0.000 rs (Gm/M 13.89 7.63 2.17 0.00 3.99	: Low : No : No : 59. : 11.5 LDGT ile) 0.00 0.00 0.00 0.00	Am Oper (F) Ma Pe HDGV 5.0 0.000 25.77 13.23 6.42 0.00 6.00	Altit bient T ating M ximum T riod 2 LDDV 5.0 0.000 1.27 1.27	ude: 5 emp: 9' RVP: 1' LDDT 5.0 0.000 1.70 1.70	500. Ft. 75.0 / 0.0 / 1. (F) 1.5 Peri HDDV 5.0 0.130 4.90 4.90	75.0 / 0.0 / dod 2 Y MC 5.0 0.000 9.99 6.05 3.48	75.0 F 0.0 r: 1988 All Veh 7.90 3.92 1.04 0.00 2.84
Cal. Year: 5.0 mph 75F Veh. Type: Veh. Spd.: VMT Mix: Composite E Total HC: Exhst HC: Evap. HC: Refuel HC: Refuel HC: Rsting HC:	1992 Anti 0%CS LDGV 5.0 0.870 6.34 3.77 1.20 0.00 3.26 0.11	I/M ti-tam. Minim Perio LDGT1 5.0 0.000 Factor 10.14 5.57 1.29 0.00 3.18 0.09	Region Program Program mum Tempod 1 RVP LDGT2 5.0 0.000 rs (Gm/M 13.89 7.63 2.17 0.00 3.99 0.10	: Low : No : No : 59. : 11.5 LDGT ile) 0.00 0.00 0.00 0.00 0.00	Am Oper (F) Ma Pe HDGV 5.0 0.000 25.77 13.23 6.42 0.00 6.00 0.13	Altit bient T ating M ximum T riod 2 LDDV 5.0 0.000 1.27 1.27	ude: 5 emp: 9 RVP: 1 ¹ LDDT 5.0 0.000 1.70 1.70	500. Ft. 75.0 / 0.0 / 1. (F) 1.5 Peri HDDV 5.0 0.130 4.90 4.90	75.0 / 0.0 / od 2 Y MC 5.0 0.000 9.99 6.05 3.48 0.46	75.0 F 0.0 r: 1988 All Veh 7.90 3.92 1.04 0.00 2.84 0.10
Cal. Year: 5.0 mph 75F Veh. Type: Veh. Spd.: VMT Mix: Composite E Total HC: Exhst HC: Evap. HC: Refuel HC: Runing HC: Exting HC: Exhst CO:	1992 Anti 0%CS LDGV 5.0 0.870 mission 8.34 3.77 1.20 0.00 3.26 0.11 71.04	I/M ti-tam. Minim Perio LDGT1 5.0 0.000 Factor 10.14 5.57 1.29 0.00 3.18 0.09 0.00	Region Program Program mum Tempod 1 RVP LDGT2 5.0 0.000 rs (Gm/H 13.89 7.63 2.17 0.00 3.99 0.10 0.00	: Low : No : No : S9. : 11.5 LDGT ile) 0.00 0.00 0.00 0.00 0.00 0.00 0.00	Am Oper (F) Ma Pe HDGV 5.0 0.000 25.77 13.23 6.42 0.00 6.00 0.13 0.00	Altit bient T ating M ximum T riod 2 LDDV 5.0 0.000 1.27 1.27 0.00	ude: 5 emp: 9' RVP: 1' LDDT 5.0 0.000 1.70 1.70	500. Ft. 75.0 / 0.0 / 1. (F) 1.5 Peri HDDV 5.0 0.130 4.90 4.90	75.0 / 0.0 / fod 2 Y MC 5.0 0.000 9.99 6.05 3.48 0.46 0.00	75.0 F 0.0 r: 1988 All Veh 7.90 3.92 1.04 0.00 2.84 0.10 66.00
Cal. Year: 5.0 mph 75F Veh. Type: Veh. Spd.: VMT Mix: Composite E Total HC: Exhst HC: Evap. HC: Refuel HC: Refuel HC: Rating HC: Exhst CO: Exhst NOX:	1992 Anti 0%CS LDGV 5.0 0.870 mission 8.34 3.77 1.20 0.00 3.26 0.11 71.04 1.13	I/M ti-tam. Minim Perio LDGT1 5.0 0.000 Factor 10.14 5.57 1.29 0.00 3.18 0.09 0.00 0.00	Region Program Program mum Tempod 1 RVP LDGT2 5.0 0.000 rs (Gm/H 13.89 7.63 2.17 0.00 3.99 0.10 0.00 0.00	: Low : No : No : S9. : 11.5 LDGT ile) 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00	Am Oper (F) Ma Pe HDGV 5.0 0.000 25.77 13.23 6.42 0.00 6.00 0.13 0.00 0.00	Altit bient T ating M ximum T riod 2 LDDV 5.0 0.000 1.27 1.27 0.00 0.00	ude: 5 emp: 9' RVP: 1' LDDT 5.0 0.000 1.70 1.70 0.00 0.00	500. Ft. 75.0 / 0.0 / 1. (F) 1.5 Peri HDDV 5.0 0.130 4.90 4.90 32.28 24.73	75.0 / 0.0 / MC 5.0 0.000 9.99 6.05 3.48 0.46 0.00 0.00	75.0 F 0.0 r: 1988 All Veh 7.90 3.92 1.04 0.00 2.84 0.00 2.84 0.10 66.00 4.20
Cal. Year: Cal. Year: 5.0 mph 75F Veh. Type: Veh. Spd.: VMT Mix: Composite E Total HC: Exhst HC: Evap. HC: Refuel HC: Rsting HC: Exhst CO: Exhst CO: Exhst NX: Hot Stabili	1992 Ant 0%CS LDGV 5.0 0.870 mission 8.34 3.77 1.20 0.00 3.26 0.11 71.04 1.13 zed Idl	I/M ti-tam. Minim Perio LDGT1 5.0 0.000 Factor 10.14 5.57 1.29 0.00 3.18 0.09 0.00 0.00 0.00 0.00	Region Program Program mum Tempod 1 RVP LDGT2 5.0 0.000 rs (Gm/H 13.89 7.63 2.17 0.00 3.99 0.10 0.00 0.00 0.00 sion Fac	: Low : No : No : S9. : 11.5 LDGT ile) 0.00 0.	Am Oper (F) Ma Pe HDGV 5.0 0.000 25.77 13.23 6.42 0.00 6.00 0.13 0.00 0.00 Gm/Hr)	Altit bient T ating M ximum T riod 2 LDDV 5.0 0.000 1.27 1.27 0.00 0.00	ude: 5 emp: 9' RVP: 1' LDDT 5.0 0.000 1.70 1.70 0.00 0.00	500. Ft. 75.0 / 0.0 / 1. (F) 1.5 Peri HDDV 5.0 0.130 4.90 4.90 32.28 24.73	75.0 / 0.0 / MC 5.0 0.000 9.99 6.05 3.48 0.46 0.00 0.00	75.0 F 0.0 r: 1988 All Veh 7.90 3.92 1.04 0.00 2.84 0.10 66.00 4.20
Cal. Year: Cal. Year: 5.0 mph 75F Veh. Type: Veh. Spd.: VMT Mix: Composite E Total HC: Exhst HC: Exhst HC: Runing HC: Rsting HC: Exhst CO: Exhst NOX: Hot Stabili Idle HC:	1992 Ant 0%CS LDGV 5.0 0.870 mission 8.34 3.77 1.20 0.00 3.26 0.11 71.04 1.13 zed Idl 24.27	I/M ti-tam. Minim Perio LDGT1 5.0 0.000 Factor 10.14 5.57 1.29 0.00 3.18 0.09 0.00 0.00 0.00 Le Emisso 0.00	Region Program Program mum Tempod 1 RVP LDGT2 5.0 0.000 rs (Gm/H 13.89 7.63 2.17 0.00 3.99 0.10 0.00 sion Fac 0.00	: Low : No : No : S9. : 11.5 LDGT ile) 0.00 0.	Am Oper (F) Ma Pe HDGV 5.0 0.000 25.77 13.23 6.42 0.00 6.00 0.13 0.00 0.13 0.00 Gm/Hr) 0.00	Altit bient T ating M ximum T riod 2 LDDV 5.0 0.000 1.27 1.27 0.00 0.00 0.00 0.00	ude: 5 emp: ode: emp: 9' RVP: 1' LDDT 5.0 0.000 1.70 1.70 0.00 0.00 0.00	500. Ft. 75.0 / 0.0 / 1. (F) 1.5 Peri HDDV 5.0 0.130 4.90 4.90 32.28 24.73 17.37	75.0 / 0.0 / MC 5.0 0.000 9.99 6.05 3.48 0.46 0.00 0.00	75.0 F 0.0 r: 1988 All Veh 7.90 3.92 1.04 0.00 2.84 0.10 66.00 4.20 23.37
Cal. Year: Cal. Year: 5.0 mph 75F Veh. Type: Veh. Spd.: VMT Mix: Composite E Total HC: Exhst HC: Exhst HC: Runing HC: Rsting HC: Exhst CO: Exhst NOX: Hot Stabili Idle HC: Idle CO:2	1992 Ant 0%CS LDGV 5.0 0.870 mission 8.34 3.77 1.20 0.00 3.26 0.11 71.00 1.13 zed Idf 24.27 93.10	I/M ti-tam. Minim Perio LDGT1 5.0 0.000 Factor 10.14 5.57 1.29 0.00 3.18 0.09 0.00 0.00 0.00	Region Program Program mum Temp od 1 RVP LDGT2 5.0 0.000 rs (Gm/M 13.89 7.63 2.17 0.00 3.99 0.10 0.00 0.00 sion Fac 0.00 0.00	: Low : No : No : S9. : 11.5 LDGT ile) 0.00	Am Oper (F) Ma Pe HDGV 5.0 0.000 25.77 13.23 6.42 0.00 6.00 0.13 0.00 0.00 Gm/Hr) 0.00	Altit bient T ating M ximum T riod 2 LDDV 5.0 0.000 1.27 1.27 0.00 0.00 0.00 0.00 0.00	ude: 5 emp: ode: emp: 9' RVP: 1' LDDT 5.0 0.000 1.70 1.70 0.00 0.00 0.00 0.00	500. Ft. 75.0 / 0.0 / 1. (F) 1.5 Peri HDDV 5.0 0.130 4.90 4.90 32.28 24.73 17.37 51.18	75.0 / 0.0 / MC 5.0 0.000 9.99 6.05 3.48 0.46 0.00 0.00 0.00	75.0 F 0.0 r: 1988 All Veh 7.90 3.92 1.04 0.00 2.84 0.10 66.00 4.20 23.37 261.65
Cal. Year: Cal. Year: 5.0 mph 75F Veh. Type: Veh. Spd.: VMT Mix: Composite E Total HC: Exhst HC: Exhst HC: Refuel HC: Runing HC: Rating HC: Exhst NOX: Hot Stabili Idle HC: Idle NOX:	1992 Ant 0%CS LDGV 5.0 0.870 imission 8.34 3.77 1.20 0.00 3.26 0.11 71.04 1.13 zed Idf 24.27 93.10 2.90	I/M ti-tam. Minim Perio LDGT1 5.0 0.000 Factor 10.14 5.57 1.29 0.00 3.18 0.09 0.00 0.00 0.00 0.00	Region Program Program mum Tempod 1 RVP LDGT2 5.0 0.000 rs (Gm/M 13.89 7.63 2.17 0.00 3.99 0.10 0.00 0.00 0.00 0.00	ile) ile) ile) is No is S9. ils S9. ils S9. ile) 0.00	Am Oper (F) Ma Pe HDGV 5.0 0.000 25.77 13.23 6.42 0.00 6.00 0.13 0.00 0.00 0.00 0.00	Altit bient T ating M ximum T riod 2 LDDV 5.0 0.000 1.27 1.27 0.00 0.00 0.00 0.00 0.00	ude: 5 emp: ode: emp: 9' RVP: 1' LDDT 5.0 0.000 1.70 1.70 0.00 0.00 0.00 0.00 0	500. Ft. 75.0 / 0.0 / 1. (F) 1.5 Peri HDDV 5.0 0.130 4.90 4.90 32.28 24.73 17.37 51.18 22.32	75.0 / 0.0 / MC 5.0 0.000 9.99 6.05 3.48 0.46 0.00 0.00 0.00 0.00 0.00	75.0 F 0.0 r: 1988 All Veh 7.90 3.92 1.04 0.00 2.84 0.10 66.00 4.20 23.37 261.65 5.43

Cal. Year: 1	992		Region	: Low		Altit	ude: 5	500. Ft.		
		I/M	Program	: No	Ал	bient 1	emp:	75.0 /	75.0 /	75.0 F
	Ant	i-tam.	Program	: No	Oper	ating M	lode:	0.0 /	0.0 /	0.0
7.5 moh 75F	0%CS					•		•		
		Minia	um Temo	59.	(F) Ma	ximum 1	emp: 91	L. (E)		
		Perio	d 1 RVP	: 11.5	Pe	riod 2	RVP: 11	.5 Peri	od 2 Y	r: 1988
Veh Type		IDGT1		IDGT	HDGV		LDDT	HDDV	MC	All Veh
ven, type:	2001		20012			2001	2001			
Veb Spd ·	75	75	7.5		7.5	7 5	7 5	75	7 5	•
VMT Mix.	0.870	0.000	0.000		0.000	0.000	0.000	0.130	0.000	1
Composite Em	ission	Factor	-s (Gm/M	ile)	0.000	0.000	0.000	0.150	0.000	
Total HC.	5 61	6 01	0 57	0 00	20 13	1 12	1 50	4 33	8 10	5 44
Evhet HC.	2 60	3 87	5.24	0.00	10 65	1 12	1 50	4.33	4 25	2 83
Evan HC:	1 20	1 20	2 17	0 00	6 42		1.50	4.55	3 48	1 04
Pofuel HC.	0 00	0 00	0 00	0 00	0.00				5.40	0 00
Render HC:	1 70	1 45	2 01	0.00	2 03					1 / 8
Roning HC.	0 11	0.00	0 10	0.00	0 17				0 / 4	0 10
Exhan COn /	4 04	0.09	0.10	0.00	0.15	0 00	0 00	74 45	0.40	/7 5/
EXAST LU: 4	1 04	0.00	0.00	0.00	0.00	0.00	0.00	20.03	0.00	43.34
EXIST NUA:		- Enico		0.00		0.00	0.00	22.42	0.00	2.02
		0 00				0.00	0.00	17 77	0 00	77 77
	4.47	0.00	0.00	0.00	0.00	0.00	0.00	11.21	0.00	23.31
	2.10	0.00	0.00	0.00	0.00	0.00	0.00	21.10	0.00	201.00
Idle NOX:	2.90	0.00	0.00	0.00	0.00	0.00	0.00	22.32	0.00	5.45
Cal Year 1	002		Region	• 1 04		Alti	ude ·	500 Et		
Cal. Year: 1	992	1/M	Region	: Low	An	Alti	tude: :	500. Ft.	75.0	75.0 F
Cal. Year: 1	992 Ant	I/M	Region Program Program	: Low : No	An	Altin bient	tude: : Temp: tode:	500. Ft. 75.0 /	75.0	75.0 F
Cal. Year: 1	992 Ant 0%CS	I/M i-tam.	Region Program Program	: Low : No : No	An Oper	Altin bient 1 ating 1	tude: ! Temp: fode:	500. Ft. 75.0 / 0.0 /	75.0 / 0.0 /	75.0 F
Cal. Year: 1 10.0mph 75F	992 Ant 0%CS	I/M i-tam. Minis	Region Program Program	: Low : No : No : 59.	An Oper (F) Ma	Altin bient 1 ating P	ude: : (emp: lode:	500. Ft. 75.0 / 0.0 /	75.0 / 0.0 /	75.0 F
Cal. Year: 1 10.0mph 75F	992 Ant 0%CS	I/M i-tam. Minin Perio	Region Program Program num Temp	: Low : No : No : 59. : 11.5	An Oper (F) Ma Pe	Altin bient 1 ating 1 aximum 1 ariod 2	iude: ! iemp: iode: iemp: 9 gvp: 1	500. Ft. 75.0 / 0.0 / 1. (F)	75.0 / 0.0 /	75.0 F
Cal. Year: 1 10.0mph 75F Veh. Type:	992 Ant 0%CS	I/M ti-tam. Minin Perio LDGT1	Region Program Program num Temp od 1 RVP LDGT2	: Low : No : No : 59. : 11.5 LDGT	An Oper (F) Ma Pe HDGV	Altin bient 1 bating 1 eximum 1 eriod 2 LDDV	tude: ! femp: fode: femp: 9 RVP: 1 LDDT	500. Ft. 75.0 / 0.0 / 1. (F) 1.5 Peri HDDV	75.0 / 0.0 / iod 2 1	75.0 F 0.0 7: 1988
Cal. Year: 1 10.0mph 75F Veh. Type:	992 Ant 0%CS LDGV	I/M i-tam. Minim Perio LDGT1	Region Program Program num Temp od 1 RVP LDGT2	: Low : No : No : 59. : 11.5 LDGT	An Oper (F) Ma Pe HDGV	Altin bient 1 sating 1 eximum 1 eriod 2 LDDV	iude: iemp: iode: iemp: 9 RVP: 1 LDDT	500. Ft. 75.0 / 0.0 / 1. (F) 1.5 Peri HDDV	75.0 / 0.0 / iod 2 1 MC	75.0 F 0.0 7 1988 All Veh
Cal. Year: 1 10.0mph 75F Veh. Type: Veh. Spd.: 1	992 Ant 0%CS LDGV	I/M i-tam. Minim Perio LDGT1	Region Program Program num Temp od 1 RVP LDGT2	: Low : No : No : 59. : 11.5 LDGT	Ann Oper (F) Ma Pe HDGV	Altin bient 1 sating P eximum 1 eriod 2 LDDV	tude: 1 femp: fode: femp: 9 RVP: 1 LDDT	500. Ft. 75.0 / 0.0 / 1. (F) 1.5 Peri HDDV	75.0 / 0.0 / iod 2 1 MC	75.0 F 0.0 (r: 1988 All Veh
Cal. Year: 1 10.0mph 75F Veh. Type: Veh. Spd.: 1 VMT Mix:	992 Ant 0%CS LDGV 0.0 0.870	I/M ii-tam. Minin Perio LDGT1 10.0 0.000	Region Program Program num Temp od 1 RVP LDGT2 10.0 0.000	: Low : No : No : 59. : 11.5 LDGT	An Oper (F) Ma Pe HDGV 10.0	Altin bient 1 sating P eriod 2 LDDV	tude: 5 femp: fode: femp: 9 RVP: 1 LDDT 10.0	500. Ft. 75.0 / 0.0 / 1. (F) 1.5 Peri HDDV	75.0 / 0.0 / iod 2 1 MC	75.0 F 0.0 (r: 1988 All Veh
Cal. Year: 1 10.0mph 75F Veh. Type: Veh. Spd.: 1 VMT Mix: Composite Fm	992 Ant 0%CS LDGV 0.0 0.870	I/M i-tam. Minin Perio LDGT1 10.0 0.000 Factor	Region Program Program num Temp od 1 RVP LDGT2 10.0 0.000 rs (Gm/M	: Low : No : No : 59. : 11.5 LDGT	An Oper (F) Ma Pe HDGV 10.0 0.000	Altin bient 1 sating P eriod 2 LDDV 10.0 0.000	tude: 5 femp: fode: femp: 9 RVP: 1 LDDT 10.0 0.000	500. Ft. 75.0 / 0.0 / 1. (F) 1.5 Peri HDDV 10.0 0.130	75.0 / 0.0 / iod 2 1 MC 10.0 0.000	75.0 F 0.0 (r: 1988 All Veh
Cal. Year: 1 10.0mph 75F Veh. Type: Veh. Spd.: 1 VMT Mix: Composite En Total HC:	992 Ant 0%CS LDGV 0.0 0.870 tission 4 65	I/M ii-tam. Minin Peric LDGT1 10.0 0.000 Factor 5.68	Region Program Program num Temp od 1 RVP LDGT2 10.0 0.000 rs (Gm/M 7 84	: Low : No : S9. : 11.5 LDGT ile) 0.00	An Oper (F) Ma Pe HDGV 10.0 0.000	Altii bient 1 sating P srind 2 LDDV 10.0 0.000	tude: 1 femp: fode: femp: 9 RVP: 1 LDDT 10.0 0.000	500. Ft. 75.0 / 0.0 / 1. (F) 1.5 Peri HDDV 10.0 0.130	75.0 / 0.0 / iod 2 1 MC 10.0 0.000	75.0 F 0.0 (r: 1988 All Veh
Cal. Year: 1 10.0mph 75F Veh. Type: Veh. Spd.: 1 VMT Mix: Composite En Total HC: Exhet HC:	992 Ant 0%CS LDGV 0.0 0.870 0.870 0155 ion 4.65 2.01	I/M i-tam. Minim Perio LDGT1 10.0 0.000 Factor 5.68 3.02	Region Program Program num Temp od 1 RVP LDGT2 10.0 0.000 rs (Gm/M 7.84 4.02	: Low : No : S9. : 11.5 LDGT ile) 0.00 0.00	An Oper (F) Ma Pe HDGV 10.0 0.000 17.46 8 67	Altii bient 1 sating P sriod 2 LDDV 10.0 0.000 0.99 0.99	Lude: ! Iemp: Iode: Iemp: 9 RVP: 1' LDDT 10.0 0.000 1.33 1.33	500. Ft. 75.0 / 0.0 / 1. (F) 1.5 Peri HDDV 10.0 0.130 3.85 3.85	75.0 / 0.0 / iod 2 1 MC 10.0 0.000 7.21 3.27	(r: 1988 All Veh
Cal. Year: 1 10.0mph 75F Veh. Type: Veh. Spd.: 1 VMT Mix: Composite Em Total HC: Exhst HC: Evan HC:	992 Ant 0XCS LDGV 0.0 0.870 0.870 0.155100 4.65 2.01	I/M i-tam. Minim Perio LDGT1 10.0 0.0000 Factor 5.68 3.02	Region Program Program num Temp Dod 1 RVP LDGT2 10.0 0.000 rs (Gm/M 7.84 4.02 2 17	: Low : No : S9. : 11.5 LDGT ile) 0.00 0.00	An Oper (F) Ma Pe HDGV 10.0 0.000 17.46 8.67 6.42	Altin bient 1 ating) criod 2 LDDV 10.0 0.000 0.99 0.99	Lude: Iemp: Iode: Iemp: 9 RVP: 1 LDDT 10.0 0.000 1.33 1.33	500. Ft. 75.0 / 0.0 / 1. (F) 1.5 Peri HDDV 10.0 0.130 3.85 3.85	75.0 / 0.0 / iod 2 1 MC 10.0 0.000 7.21 3.27 3.48	75.0 F 0.0 (r: 1988 All Veh
Cal. Year: 1 10.0mph 75F Veh. Type: Veh. Spd.: 1 VMT Mix: Composite Em Total HC: Exhst HC: Evap. HC: Pefuel HC:	992 Ant 0XCS LDGV 0.0 0.870 0.870 0.870 0.55 2.01 1.20 0.00	I/M i-tam. Minin Perio LDGT1 10.0 0.000 Factor 5.68 3.02 1.29 0.00	Region Program Program num Temp dd 1 RVP LDGT2 10.0 0.000 rs (Gm/M 7.84 4.02 2.17 0.00	: Low : No : S9. : 11.5 LDGT ile) 0.00 0.00 0.00 0.00	An Oper (F) Ma Pe HDGV 10.0 0.000 17.46 8.67 6.42 0.00	Altin bient 1 ating) criod 2 LDDV 10.0 0.000 0.99 0.99	tude: ! femp: lode: RVP: 1 LDDT 10.0 0.000 1.33 1.33	500. Ft. 75.0 / 0.0 / 1. (F) 1.5 Peri HDDV 10.0 0.130 3.85 3.85	75.0 / 0.0 / iod 2 1 MC 10.0 0.000 7.21 3.27 3.48	75.0 F 0.0 (r: 1988 All Veh
Cal. Year: 1 10.0mph 75F Veh. Type: Veh. Spd.: 1 VMT Mix: Composite Em Total HC: Exhst HC: Evap. HC: Refuel HC: Refuel HC:	992 Ant 0%CS LDGV 0.0 0.870 0.870 0.870 0.870 11 20 0.00 1 34	I/M i-tam. Minin Perio LDGT1 10.0 0.000 Factor 5.68 3.02 1.29 0.00 1 28	Region Program Program num Temp od 1 RVP LDGT2 10.0 0.000 rs (Gm/M 7.84 4.02 2.17 0.00 1 55	: Low : No : S9. : 11.5 LDGT ile) 0.00 0.00 0.00 0.00	An Oper (F) Ma Pe HDGV 10.0 0.000 17.46 8.67 6.42 0.00 2.24	Altin bient 1 sating) aximum 1 rriod 2 LDDV 10.0 0.000 0.99 0.99	Code: Comp: Code: Co	500. Ft. 75.0 / 0.0 / 1. (F) 1.5 Peri HDDV 10.0 0.130 3.85 3.85	75.0 / 0.0 / iod 2 1 MC 10.0 0.000 7.21 3.27 3.48	(75.0 F 0.0 (r: 1988 All Veh
Cal. Year: 1 10.0mph 75F Veh. Type: Veh. Spd.: 1 VMT Mix: Composite Em Total HC: Exhst HC: Evap. HC: Refuel HC: Runing HC:	992 Ant 0%CS LDGV 0.0 0.870 1155 ion 4.65 2.01 1.20 0.00 1.34 0.11	I/M i-tam. Minin Peric LDGT1 10.0 0.000 Factor 5.68 3.02 1.29 0.00 1.28 0.00	Region Program Program num Temp od 1 RVP LDGT2 10.0 0.000 rs (Gm/M 7.84 4.02 2.17 0.00 1.55 0 10	: Low : No : S9. : 11.5 LDGT ile) 0.00 0.00 0.00 0.00 0.00	An Oper (F) Ma Pe HDGV 10.0 0.000 17.46 8.67 6.42 0.00 2.24 0.13	Altin bient 1 sating) aximum 1 eriod 2 LDDV 10.0 0.000 0.99 0.99	Cemp: femp: fode: remp: 9' RVP: 1' LDDT 10.0 0.000 1.33 1.33	500. Ft. 75.0 / 0.0 / 1. (F) 1.5 Peri HDDV 10.0 0.130 3.85 3.85	75.0 / 0.0 / MC 10.0 7.21 3.27 3.48	75.0 F 0.0 (r: 1988 All Veh 4.55 2.25 1.04 0.00 1.16 0.10
Cal. Year: 1 10.0mph 75F Veh. Type: Veh. Spd.: 1 VMT Mix: Composite Em Total HC: Exhst HC: Evap. HC: Refuel HC: Runing HC: Rsting HC:	992 Ant 0%CS LDGV 0.0 0.870 1:55 ion 4.65 2.01 1.20 0.00 1.34 0.11	I/M i-tam. Minin Perio LDGT1 10.0 5.68 3.02 1.29 0.00 1.28 0.00	Region Program Program num Temp dd 1 RVP LDGT2 10.0 0.000 rs (Gm/M 7.84 4.02 2.17 0.00 1.55 0.10 0.00	: Low : No : S9. : 11.5 LDGT 0.00 0.00 0.00 0.00 0.00 0.00 0.00	An Oper (F) Ma Pe HDGV 10.0 0.000 17.46 8.67 6.42 0.00 2.24 0.00 2.24 0.00	Altin bient 1 rating) ximum 1 riod 2 LDDV 10.0 0.000 0.99 0.99	Cemp: 9 Cemp: 9 RVP: 1 LDDT 10.0 0.000 1.33 1.33	500. Ft. 75.0 / 0.0 / 1. (F) 1.5 Peri HDDV 10.0 0.130 3.85 3.85	75.0 / 0.0 / MC 10.0 7.21 3.27 3.48 0.46	75.0 F 0.0 (r: 1988 All Veh 4.55 2.25 1.04 0.00 1.16 0.200
Cal. Year: 1 10.0mph 75F Veh. Type: Veh. Spd.: 1 VMT Mix: Composite En Total HC: Exhst HC: Evap. HC: Refuel HC: Runing HC: Rsting HC: Exhst CO: 3 Exhst MOX	992 Ant 0%CS LDGV 0.0 0.870 nission 4.65 2.01 1.20 0.00 1.34 0.11 3.56	I/M i-tam. Minin Perio LDGT1 10.0 0.000 Factor 5.68 3.02 1.29 0.00 1.28 0.09 0.00	Region Program Program num Tempod 1 RVP LDGT2 10.0 0.000 rs (Gm/M 7.84 4.02 2.17 0.00 1.55 0.10 0.00 0.00	: Low : No : S9. : 11.5 LDGT 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.	An Oper (F) Ma Pe HDGV 10.0 0.000 17.46 8.67 6.42 0.00 2.24 0.13 0.00 0.00	Altin bient 1 rating) ximum 1 riod 2 LDDV 10.0 0.000 0.99 0.99	Cude: 9 Cemp: 9 RVP: 1 LDDT 10.0 0.000 1.33 1.33 0.00 0.00	500. Ft. 75.0 / 0.0 / 1. (F) 1.5 Peri HDDV 10.0 0.130 3.85 3.85 222.26 20.52	75.0 / 0.0 / MC 10.0 7.21 3.27 3.48 0.46 0.00	75.0 F 0.0 (r: 1988 All Veh 4.55 2.25 1.04 0.00 1.16 0.10 32.09 3.55
Cal. Year: 1 10.0mph 75F Veh. Type: Veh. Spd.: 1 VMT Mix: Composite En Total HC: Exhst HC: Evap. HC: Refuel HC: Runing HC: Rsting HC: Exhst CO: 3 Exhst NOX:	992 Ant 0%CS LDGV 0.0 0.870 0.870 0.870 0.870 0.870 0.870 0.870 0.356 0.00 1.34 0.11 3.56 1.02	I/M i-tam. Minin Perio LDGT1 10.0 0.000 Factor 5.68 3.02 1.29 0.00 1.28 0.09 0.00 0.00 0.00	Region Program Program num Tempod 1 RVP LDGT2 10.0 0.000 rs (Gm/M 7.84 4.02 2.17 0.00 1.55 0.10 0.00 0.00 0.00	: Low : No : No : 59. : 11.5 LDGT . 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00	An Oper (F) Ma Pe HDGV 10.0 0.000 17.46 8.67 6.42 0.00 2.24 0.13 0.00 0.00 0.00	Altin beint 1 brind 2 LDDV 10.0 0.000 0.99 0.99 0.00 0.00	Cude: Cemp: femp: fode: Femp: 97 RVP: 17 LDDT 10.0 0.000 1.33 1.33 0.00 0.00	500. Ft. 75.0 / 0.0 / 1.5 Peri HDDV 10.0 0.130 3.85 3.85 222.26 20.52	75.0 / 0.0 / MC 10.0 0.000 7.21 3.27 3.48 0.46 0.00 0.00	75.0 F 0.0 (r: 1988 All Veh 4.55 2.25 1.04 0.00 1.16 0.10 32.09 3.55
Cal. Year: 1 10.0mph 75F Veh. Type: Veh. Spd.: 1 VMT Mix: Composite En Total HC: Exhst HC: Evap. HC: Refuel HC: Runing HC: Rsting HC: Exhst CO: 3 Exhst NOX: Hot Stabiliz	992 Ant 0%CS LDGV 0.0 0.870 0.870 0.870 0.870 0.870 0.870 0.870 0.350 1.20 0.00 1.34 0.11 3.56 1.02 ted Idl	I/M i-tam. Minim Perio LDGT1 10.0 0.000 Factor 5.68 3.02 1.29 0.00 1.28 0.09 0.00 0.00 0.00 0.00 0.00 0.00	Region Program Program num Tempo d 1 RVP LDGT2 10.0 0.000 rs (Gm/M 7.84 4.02 2.17 0.00 1.55 0.10 0.00 0.00 0.00 0.00 0.00	: Low : No : No : 59. : 11.5 LDGT . 100 0.00 0	An Oper (F) Ma Pe HDGV 10.0 0.000 17.46 8.67 6.42 0.00 2.24 0.13 0.00 0.00 Gm/Hr) 0.00	Altin beint 1 brind 2 LDDV 10.0 0.000 0.99 0.99 0.99	Cude: Cemp: Code: Cemp: 97 RVP: 17 LDDT 10.0 0.000 1.33 1.33 0.00 0.00 0.00	500. Ft. 75.0 / 0.0 / 1.5 Peri HDDV 10.0 0.130 3.85 3.85 222.26 20.52	75.0 / 0.0 / MC 10.0 7.21 3.27 3.48 0.46 0.00 0.00	75.0 F 0.0 (r: 1988 All Veh 4.55 2.25 1.04 0.00 1.16 0.10 32.09 3.55 23.37
Cal. Year: 1 10.0mph 75F Veh. Type: Veh. Spd.: 1 VHT Mix: Composite Em Total HC: Exhst HC: Evap. HC: Refuel HC: Runing HC: Rsting HC: Exhst CO: 3 Exhst NOX: Hot Stabiliz Idle HC: 2	992 Ant 0%CS LDGV 0.0 0.870 1:55 ion 4.65 2.01 1.20 0.00 1.34 0.11 3.56 1.02 ted Idl 24.27 5.10	I/M i-tam. Minim Perio LDGT1 10.0 0.000 Factor 5.68 3.02 1.29 0.00 1.28 0.09 0.00 0.00 0.00 e Emiss 0.00 0.00	Region Program Program num Tempo d 1 RVP LDGT2 10.0 0.000 rs (Gm/M 7.84 4.02 2.17 0.00 1.55 0.10 0.00 0.00 0.00 sion Fac 0.00 0.00	: Low : No : No : 59. : 11.5 LDGT ile) 0.00 0.	An Oper (F) Ma Pe HDGV 10.0 0.000 17.46 8.67 6.42 0.00 2.24 0.13 0.00 0.00 Gm/Hr) 0.00	Altin beint 1 rating) ximum 1 riod 2 LDDV 10.0 0.000 0.99 0.99 0.99 0.99	Cude: Cemp: Code: Cemp: 97 RVP: 17 LDDT 10.0 0.000 1.33 1.33 0.00 0.00 0.00 0.00	500. Ft. 75.0 / 0.0 / 1. (F) 1.5 Peri HDDV 10.0 0.130 3.85 3.85 222.26 20.52 17.37 51 18	75.0 / 0.0 / MC 10.0 7.21 3.27 3.48 0.46 0.00 0.00	75.0 F 0.0 (r: 1988 All Veh 4.55 2.25 1.04 0.00 1.16 0.10 32.09 3.55 23.37 241.65
Cal. Year: 1 10.0mph 75F Veh. Type: Veh. Spd.: 1 VMT Mix: Composite Em Total HC: Exhst HC: Evap. HC: Refuel HC: 2 Runing HC: Exhst CO: 3 Exhst NOX: Hot Stabiliz Idle HC: 22 Idle VOY:	992 Ant 0%CS LDGV 0.0 0.870 1:55 ion 4.65 2.01 1.20 0.00 1.34 0.11 3.56 1.02 ed Idl 24.27 3.10	I/M i-tam. Minin Perio LDGT1 10.0 5.68 3.02 1.29 0.00 1.28 0.09 0.00 0.00 e Emiss 0.00 0.00 0.00	Region Program Program Dd 1 RVP LDGT2 10.0 0.000 rs (Gm/M 7.84 4.02 2.17 0.00 1.55 0.10 0.00 0.00 0.00 0.00 0.00	: Low : No : No : 59. : 11.5 LDGT ile) 0.00 0.	An Oper (F) Ma Pe HDGV 10.0 0.000 17.46 8.67 6.42 0.00 2.24 0.13 0.00 0.00 Gm/Hr) 0.00 0.00	Altin beint 1 rating) ximum 1 riod 2 LDDV 10.0 0.000 0.99 0.99 0.99 0.99 0.99	Cude: Cemp: Code: Cemp: 97 RVP: 17 LDDT 10.0 0.000 1.33 1.33 0.00 0.00 0.00 0.00 0.00	500. Ft. 75.0 / 0.0 / 1. (F) 1.5 Peri HDDV 10.0 0.130 3.85 3.85 222.26 20.52 17.37 51.18 22.25	75.0 / 0.0 / MC 10.0 7.21 3.27 3.48 0.46 0.00 0.00 0.00	75.0 F 0.0 (r: 1988 All Veh 4.55 2.25 1.04 0.00 1.16 0.10 32.09 3.55 23.37 261.65 5.47

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Web Times	IDCV	LDCT1		1007	HDCV		LODT		MC 1	ALL Vob
ven. Type:	LDGA	LUGII	LUGIZ	LUGI	nouv	LUUV	LUUT	HUU V	ПC	ALL VEN
Veh. Spd. :	12.5	12.5	12.5		12.5	12.5	12.5	12.5	12.5	
VHT Mix:	0.870	0.000	0.000		0.000	0.000	0.000	0.130	0.000)
Composite E	mission	Facto	rs (Gm/M	ile)						
Total HC:	4.06	4.91	6.81	0.00	15.48	0.89	1.19	3.44	6.64	3.98
Exhst HC:	1.66	2.51	3.31	0.00	7.13	0.89	1.19	3.44	2.69	1.89
Evap. HC:	1.20	1.29	2.17	0.00	6.42				3.48	1.04
Refuel HC:	0.00	0.00	0.00	0.00	0.00					0.00
Runing HC:	1.09	1.02	1.24	0.00	1.81					0.95
Rsting HC:	0.11	0.09	0.10	0.00	0.13				0.46	0.10
Exhst CO:	26.12	0.00	0.00	0.00	0.00	0.00	0.00	18.80	0.00	25.17
Exhst NOX:	0.99	0.00	0.00	0.00	0.00	0.00	0.00	18.94	0.00	3.32
Hot Stabili	zed Id	le Emiss	sion Fac	tors (Gm/Hr)					
Idle HC:	24.27	0.00	0.00	0.00	0.00	0.00	0.00	17.37	0.00	23.37
Idle CO:2	93.10	0.00	0.00	0.00	0.00	0.00	0.00	51.18	0.00	261.65
Idle NOX:	2.90	0.00	0.00	0.00	0.00	0.00	0.00	22.32	0.00	5.43
		·.								
Cal. Year:	1992		Region	: Low		Alti	tude:	500. Ft.		
Cal. Year:	1992	1/M	Region Program	: Low : No	Ar	Altin	tude: 5 Temp:	500. Ft. 75.0 /	75.0 /	75.0 F
Cal. Year:	1992 Ant	I/M ti-tam.	Region Program Program	: Low : No : No	Ar Oper	Altin mbient i rating P	tude: 5 Temp: fode:	500. Ft. 75.0 / 0.0 /	75.0 / 0.0 /	75.0 F
Cal. Year: 15.0mph 75F	1992 Ani 0%CS	I/M ti-tam.	Region Program Program	: Low : No : No	Ar Oper	Altin mbient rating P	tude: 5 Temp: tode:	500. Ft. 75.0 / 0.0 /	75.0 / 0.0 /	75.0 F
Cal. Year: 15.0mph 75F	1992 Ant 0%CS	I/M ti-tam. Minin	Region Program Program mum Temp	: Low : No : No : 59.	Ar Oper (F) Ma	Altin mbient rating P aximum	tude: : Temp: Node: Temp: 9	500. Ft. 75.0 / 0.0 / 1. (F)	75.0 / 0.0 /	75.0 F 0.0
Cal. Year: 15.0mph 75f	1992 Ant 0%CS	I/M ti-tam. Minin Perio	Region Program Program mum Temp od 1 RVP	: Low : No : No : 59. : 11.5	Ar Oper (F) Ma Po	Altin mbient rating P aximum eriod 2	tude: 5 Temp: Node: Temp: 9 RVP: 1	500. Ft. 75.0 / 0.0 / 1. (F) 1.5 Peri	75.0 / 0.0 /	75.0 F 0.0
Cal. Year: 15.0mph 75F Veh. Type:	1992 Ant 0%CS	I/M ti-tam. Minin Perio LDGT1	Region Program Program mum Temp od 1 RVP LDGT2	: Low : No : No : 59. : 11.5 LDGT	Ar Oper (F) Ma Po HDGV	Altin mbient rating aximum eriod 2 LDDV	tude: 5 Temp: Node: Temp: 9 RVP: 1 LDDT	500. Ft. 75.0 / 0.0 / 1. (F) 1.5 Peri HDDV	75.0 / 0.0 / od 2 1 MC	75.0 F 0.0 (r: 1988 All Veh
Cal. Year: 15.0mph 75F Veh. Type:	1992 Ant 0%CS LDGV	I/M ti-tam. Minin Perio LDGT1	Region Program Program mum Temp od 1 RVP LDGT2	: Low : No : No : 59. : 11.5 LDGT	Ar Oper (F) Ma Po HDGV	Altin mbient 1 rating P aximum 1 eriod 2 LDDV	tude: 5 Temp: Node: Temp: 9 RVP: 1 LDDT	500. Ft. 75.0 / 0.0 / 1. (F) 1.5 Peri HDDV	75.0 / 0.0 / od 2 1 MC	75.0 F 0.0 (r: 1988 All Veh
Cal. Year: 15.0mph 75f Veh. Type: Veh. Spd.:	1992 Ani 0%CS LDGV	I/M ti-tam. Minin Perio LDGT1 15.0	Region Program Program mum Temp od 1 RVP LDGT2 15.0	: Low : No : No : 59. : 11.5 LDGT	Ar Oper (F) Ma HDGV 15.0	Altin mbient f rating P aximum eriod 2 LDDV 15.0	tude: 5 Temp: Node: Temp: 9 RVP: 1 LDDT 15.0	500. Ft. 75.0 / 0.0 / 1. (F) 1.5 Peri HDDV 15.0	75.0 / 0.0 / od 2 1 MC 15.0	75.0 F 0.0 (r: 1988 All Veh
Cal. Year: 15.0mph 75F Veh. Type: Veh. Spd.: VHT Mix:	1992 Ani 0%CS LDGV 15.0 0.870	I/M ti-tam. Minin Perio LDGT1 15.0 0.000	Region Program Program mum Temp od 1 RVP LDGT2 15.0 0.000	: Low : No : No : 59. : 11.5 LDGT	Ar Oper (F) Ma HDGV 15.0 0.000	Altin mbient f rating P aximum eriod 2 LDDV 15.0 0.000	tude: 5 femp: fode: femp: 9 RVP: 1 LDDT 15.0 0.000	500. Ft. 75.0 / 0.0 / 1. (F) 1.5 Peri HDDV 15.0 0.130	75.0 / 0.0 / od 2 1 MC 15.0 0.000	75.0 F 0.0 (r: 1988 All Veh
Cal. Year: 15.0mph 75F Veh. Type: Veh. Spd.: VHT Mix: Composite E	1992 Ant 0%CS LDGV 15.0 0.870 imission	I/M ti-tam. Minin Perio LDGT1 15.0 0.000 n Factor	Region Program Program mum Temp od 1 RVP LDGT2 15.0 0.000 rs (Gm/M	: Low : No : No : 59. : 11.5 LDGT ile)	Ar Oper (F) Ma Pr HDGV 15.0 0.000	Altin mbient rating eriod 2 LDDV 15.0 0.000	tude: 5 femp: fode: RVP: 1 LDDT 15.0 0.000	500. Ft. 75.0 / 0.0 / 1. (F) 1.5 Peri HDDV 15.0 0.130	75.0 / 0.0 / ocd 2 1 MC 15.0 0.000	75.0 F 0.0 (r: 1988 All Veh
Cal. Year: 15.0mph 75F Veh. Type: Veh. Spd.: VHT Mix: Composite E Total HC:	1992 An: 0XCS LDGV 15.0 0.870 mission 3.64	I/M ti-tam. Minin Perio LDGT1 15.0 0.000 Factor 4.38	Region Program Program mum Temp od 1 RVP LDGT2 15.0 0.000 rs (Gm/M 6.11	: Low : No : S9. : 11.5 LDGT ile) 0.00	Ar Oper (F) Ma Pr HDGV 15.0 0.000 13.97	Altin mbient f rating P eriod 2 LDDV 15.0 0.000 0.80	tude: 5 Temp: Hode: Temp: 9 RVP: 1 LDDT 15.0 0.000 1.07	500. Ft. 75.0 / 0.0 / 1. (F) 1.5 Peri HDDV 15.0 0.130 3.09	75.0 / 0.0 / ocd 2 1 MC 15.0 0.000 6.27	75.0 F 0.0 (r: 1988 All Veh 3.56
Cal. Year: 15.0mph 75F Veh. Type: Veh. Spd.: VHT Mix: Composite E Total HC: Exhst HC:	1992 An: 0xcs LDGV 15.0 0.870 mission 3.64 1.42	I/M ti-tam. Minin Perin LDGT1 15.0 0.000 Factor 4.38 2.17	Region Program Program mum Temp od 1 RVP LDGT2 15.0 0.000 rs (Gm/M 6.11 2.84	: Low : No : No : 59. : 11.5 LDGT ile) 0.00 0.00	Ar Open (F) Ma Pr HDGV 15.0 0.000 13.97 5.92	Altim mbient f rating) aximum f eriod 2 LDDV 15.0 0.000 0.80 0.80	tude: 5 femp: fode: femp: 97 RVP: 17 LDDT 15.0 0.000 1.07 1.07	500. Ft. 75.0 / 0.0 / 1. (F) 1.5 Peri HDDV 15.0 0.130 3.09 3.09	75.0 / 0.0 / od 2 1 MC 15.0 0.000 6.27 2.33	75.0 F 0.0 (r: 1988 All Veh 3.56 1.64
Cal. Year: 15.0mph 75f Veh. Type: Veh. Spd.: VHT Mix: Composite E Total HC: Exhst HC: Evap. HC:	1992 Ant 0%CS LDGV 15.0 0.870 3.64 1.42 1.20	I/M ti-tam. Minin Perio LDGT1 15.0 0.000 Factor 4.38 2.17 1.29	Region Program Program mum Temp od 1 RVP LDGT2 15.0 0.000 rs (Gm/H 6.11 2.84 2.17	: Low : No : No : 59. : 11.5 LDGT ile) 0.00 0.00 0.00	Ar Open (F) M: Pr HDGV 15.0 0.000 13.97 5.92 6.42	Altim mbient f rating P aximum f eriod 2 LDDV 15.0 0.000 0.80 0.80	tude: 5 femp: fode: femp: 9 RVP: 1 LDDT 15.0 0.000 1.07 1.07	500. Ft. 75.0 / 0.0 / 1. (F) 1.5 Peri HDDV 15.0 0.130 3.09 3.09	75.0 / 0.0 / 0.0 / MC 15.0 0.000 6.27 2.33 3.48	75.0 F 0.0 (r: 1988 All Veh 3.56 1.64 1.04
Cal. Year: 15.0mph 75f Veh. Type: Veh. Spd.: VHT Mix: Composite E Total HC: Exhst HC: Evap. HC: Refuel HC:	1992 Ant 0%CS LDGV 15.0 0.870 3.64 1.42 1.20 0.00	I/M ti-tam. Minin Perio LDGT1 15.0 0.000 Factor 4.38 2.17 1.29 0.00	Region Program Program mum Temp od 1 RVP LDGT2 15.0 0.000 rs (Gm/H 6.11 2.84 2.17 0.00	: Low : No : S9. : 11.5 LDGT 0.00 0.00 0.00 0.00	Ar Open (F) Ma Pr HDGV 15.0 0.000 13.97 5.92 6.42 0.00	Altim mbient f rating) aximum f eriod 2 LDDV 15.0 0.000 0.80 0.80	tude: 5 femp: fode: remp: 97 RVP: 17 LDDT 15.0 0.000 1.07 1.07	500. Ft. 75.0 / 0.0 / 1. (F) 1.5 Peri HDDV 15.0 0.130 3.09 3.09	75.0 / 0.0 / mc 15.0 0.000 6.27 2.33 3.48	75.0 F 0.0 (r: 1988 All Veh 3.56 1.64 1.04 0.00
Cal. Year: 15.0mph 75F Veh. Type: Veh. Spd.: VHT Mix: Composite E Total HC: Exhst HC: Evap. HC: Refuel HC: Runing HC:	1992 Ant 0%CS LDGV 15.0 0.870 3.64 1.42 1.20 0.00 0.91	I/M ti-tam. Minin Perio LDGT1 15.0 0.000 Factor 4.38 2.17 1.29 0.00 0.82	Region Program Program mum Temp od 1 RVP LDGT2 15.0 0.000 rs (Gm/M 6.11 2.84 2.17 0.00 1.01	: Low : No : S9. : 11.5 LDGT 0.00 0.00 0.00 0.00 0.00	Ar Open (F) Ma Pr HDGV 15.0 0.000 13.97 5.92 6.42 0.00 1.50	Altin mbient f rating) aximum f eriod 2 LDDV 15.0 0.000 0.80 0.80	tude: 5 femp: fode: remp: 97 RVP: 17 LDDT 15.0 0.000 1.07 1.07	500. Ft. 75.0 / 0.0 / 1. (F) 1.5 Peri HDDV 15.0 0.130 3.09 3.09	75.0 / 0.0 / mc 15.0 0.000 6.27 2.33 3.48	75.0 F 0.0 (r: 1988 All Veh 3.56 1.64 1.04 0.00 0.79
Cal. Year: 15.0mph 75F Veh. Type: Veh. Spd.: VHT Mix: Composite E Total HC: Exhst HC: Evap. HC: Refuel HC: Runing HC: Rsting HC:	1992 Ant 0%CS LDGV 15.0 0.870 3.64 1.42 1.20 0.00 0.91 0.11	I/M ti-tam. Minin Perio LDGT1 15.0 0.000 Factor 4.38 2.17 1.29 0.00 0.82 0.09	Region Program Program mum Temp od 1 RVP LDGT2 15.0 0.000 rs (Gm/M 6.11 2.84 2.17 0.00 1.01 0.10	: Low : No : No : 59. : 11.5 LDGT 0.00 0.00 0.00 0.00 0.00 0.00 0.00	Ar Open (F) Ma Pr HDGV 15.0 0.000 13.97 5.92 6.42 0.00 1.50 0.13	Altin mbient f rating P aximum f eriod 2 LDDV 15.0 0.000 0.80 0.80	tude: 1 femp: fode: remp: 9' RVP: 1' LDDT 15.0 0.000 1.07 1.07	500. Ft. 75.0 / 0.0 / 1. (F) 1.5 Peri HDDV 15.0 0.130 3.09 3.09	75.0 / 0.0 / mc 15.0 0.000 6.27 2.33 3.48 0.46	75.0 F 0.0 (r: 1988 All Veh 3.56 1.64 1.04 0.00 0.79 0.10
Cal. Year: 15.0mph 75F Veh. Type: Veh. Spd.: VHT Mix: Composite E Total HC: Exhst HC: Evap. HC: Refuel HC: Runing HC: Rsting HC: Exhst CO:	1992 Ant 0%CS LDGV 15.0 0.870 3.64 1.42 1.20 0.00 0.91 0.11 21.22	I/M ti-tam. Minin Perio LDGT1 15.0 0.000 Factor 4.38 2.17 1.29 0.00 0.82 0.09 0.00	Region Program Program mum Temp od 1 RVP LDGT2 15.0 0.000 rs (Gm/M 6.11 2.84 2.17 0.00 1.01 0.10 0.00	: Low : No : No : 59. : 11.5 LDGT 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.	Ar Open (F) Ma Po HDGV 15.0 0.000 13.97 5.92 6.42 0.00 1.50 0.13 0.00	Altim mbient f rating) aximum f eriod 2 LDDV 15.0 0.000 0.80 0.80 0.80	tude: 5 femp: fode: remp: 97 RVP: 17 LDDT 15.0 0.000 1.07 1.07 0.00	500. Ft. 75.0 / 0.0 / 1. (F) 1.5 Peri HDDV 15.0 0.130 3.09 3.09	75.0 / 0.0 / mc 15.0 0.000 6.27 2.33 3.48 0.46 0.00	75.0 F 0.0 (r: 1988 All Veh 3.56 1.64 1.04 0.00 0.79 0.10 20.55
Cal. Year: 15.0mph 75F Veh. Type: Veh. Spd.: VHT Mix: Composite E Total HC: Exhst HC: Evap. HC: Refuel HC: Runing HC: Exhst CO: Exhst NOX:	1992 Ant 0%CS LDGV 15.0 0.870 3.64 1.42 1.20 0.00 0.91 0.11 21.22 0.98	I/M ti-tam. Minin Perio LDGT1 15.0 0.000 Factor 4.38 2.17 1.29 0.00 0.82 0.09 0.00 0.00	Region Program Program mum Temp od 1 RVP LDGT2 15.0 0.000 rs (Gm/M 6.11 2.84 2.17 0.00 1.01 0.10 0.00 0.00	: Low : No : No : 59. : 11.5 LDGT 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.	Ar Open (F) Ma Pr HDGV 15.0 0.000 13.97 5.92 6.42 0.00 1.50 0.13 0.00 0.00	Altin mbient 1 rating) aximum 1 eriod 2 LDDV 15.0 0.000 0.80 0.80 0.80 0.80	tude: femp: fode: femp: 9' RVP: 1' LDDT 15.0 0.000 1.07 1.07 0.00 0.00	500. Ft. 75.0 / 0.0 / 1. (F) 1.5 Peri HDDV 15.0 0.130 3.09 3.09 16.06 17.64	75.0 / 0.0 / MC 15.0 0.000 6.27 2.33 3.48 0.46 0.00 0.00	75.0 F 0.0 (r: 1988 All Veh 3.56 1.64 1.04 0.00 0.79 0.10 20.55 3.14
Cal. Year: 15.0mph 75F Veh. Type: Veh. Spd.: VHT Mix: Composite E Total HC: Exhst HC: Refuel HC: Runing HC: Rsting HC: Exhst CO: Exhst NOX: Hot Stabili	1992 Anti 0%CS LDGV 15.0 0.870 3.64 1.42 1.20 0.00 0.91 0.11 21.22 0.98 zed Id	I/M ti-tam. Minin Perio LDGT1 15.0 0.000 Factor 4.38 2.17 1.29 0.00 0.82 0.09 0.00 0.00 0.00 le Emiss	Region Program Program mum Temp od 1 RVP LDGT2 	: Low : No : No : S9. : 11.5 LDGT 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0	Ar Oper (F) Ma Po HDGV 15.0 0.000 13.97 5.92 6.42 0.00 1.50 0.13 0.00 0.00 Gm/Hr)	Altiin mbient 1 rating) aximum 1 eriod 2 LDDV 15.0 0.000 0.80 0.80 0.80 0.80	tude: ! femp: fode: remp: 9' RVP: 1' LDDT 15.0 0.000 1.07 1.07 0.00 0.00	500. Ft. 75.0 / 0.0 / 1. (F) 1.5 Peri HDDV 15.0 0.130 3.09 3.09 16.06 17.64	75.0 / 0.0 / mc 15.0 0.000 6.27 2.33 3.48 0.46 0.00 0.00	75.0 F 0.0 (r: 1988 All Veh 3.56 1.64 1.04 0.00 0.79 0.10 20.55 3.14
Cal. Year: 15.0mph 75F Veh. Type: Veh. Spd.: VMT Mix: Composite E Total HC: Exhst HC: Evap. HC: Refuel HC: Runing HC: Exhst CO: Exhst NOX: Hot Stabili Idle HC:	1992 Anti 0%CS LDGV 15.0 0.870 3.64 1.42 1.20 0.00 0.91 0.11 21.22 0.98 zed Id 24.27	I/M ti-tam. Minin Perio LDGT1 15.0 0.000 Factor 4.38 2.17 1.29 0.00 0.82 0.09 0.00 0.00 0.00 0.00 0.00	Region Program Program mum Temp od 1 RVP LDGT2 	: Low : No : No : S9. : 11.5 LDGT ile) 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.	Ar Oper (F) Ma PG HDGV 15.0 0.000 13.97 5.92 6.42 0.00 1.50 0.13 0.00 0.00 Gm/Hr) 0.00	Altin mbient 1 rating P eriod 2 LDDV 15.0 0.000 0.80 0.80 0.80 0.00 0.00 0.00	tude: 5 femp: kode: femp: 9 RVP: 1 LDDT 15.0 0.000 1.07 1.07 0.00 0.00 0.00	500. Ft. 75.0 / 0.0 / 1. (F) 1.5 Peri HDDV 15.0 0.130 3.09 3.09 16.06 17.64 17.37	75.0 / 0.0 / mc 15.0 0.000 6.27 2.33 3.48 0.46 0.00 0.00 0.00	75.0 F 0.0 (r: 1988 All Veh 3.56 1.64 1.04 0.79 0.10 20.55 3.14 23.37
Cal. Year: 15.0mph 75F Veh. Type: Veh. Spd.: VHT Mix: Composite E Total HC: Exhst HC: Evap. HC: Refuel HC: Rsting HC: Exhst CO: Exhst NOX: Hot Stabili Idle HC: Idle Co:2	1992 Anti 0XCS LDGV 15.0 0.870 3.64 1.42 1.20 0.00 0.91 0.11 21.22 0.98 zed Idi 24.27 193.10	I/M ti-tam. Minin Perio LDGT1 15.0 0.000 Factor 4.38 2.17 1.29 0.00 0.82 0.09 0.00 0.00 Le Emiss 0.00 0.00	Region Program Program mum Tempod 1 RVP LDGT2 15.0 0.000 rs (Gm/H 6.11 2.84 2.17 0.00 1.01 0.10 0.00 0.00 0.00 0.00 0	: Low : No : No : S9. : 11.5 LDGT ile) 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.	Ar Open (F) Ha HDGV 15.0 0.000 13.97 5.92 6.42 0.00 1.50 0.13 0.00 0.00 Gm/Hr) 0.00 0.00	Altii mbient 1 rating P eriod 2 LDDV 15.0 0.000 0.80 0.80 0.80 0.00 0.00 0.00	tude: 5 femp: kode: femp: 9 RVP: 1 LDDT 15.0 0.000 1.07 1.07 0.00 0.00 0.00 0.00	500. Ft. 75.0 / 0.0 / 1. (F) 1.5 Peri HDDV 15.0 0.130 3.09 3.09 16.06 17.64 17.37 51.18	75.0 / 0.0 / mc 15.0 0.000 6.27 2.33 3.48 0.46 0.00 0.00 0.00 0.00	75.0 F 0.0 (r: 1988 All Veh 3.56 1.64 1.04 0.00 0.79 0.10 20.55 3.14 23.37 261.65
Cal. Year: 15.0mph 75F Veh. Type: Veh. Spd.: VHT Mix: Composite E Total HC: Exhst HC: Evap. HC: Refuel HC: Runing HC: Rsting HC: Exhst NOX: Hot Stabili Idle HC: Idle CO:2 Idle NOX:	1992 Anti 0XCS LDGV 15.0 0.870 3.64 1.42 1.20 0.00 0.91 0.11 21.22 0.98 zed Id 24.27 93.10 2.90	I/M ti-tam. Minin Perio LDGT1 15.0 0.000 Factor 4.38 2.17 1.29 0.00 0.82 0.09 0.00 0.00 Le Emiss 0.00 0.00 0.00	Region Program Program mum Temp od 1 RVP LDGT2 	: Low : No : No : S9. : 11.5 LDGT ile) 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.	Ar Open (F) Ha HDGV 15.0 0.000 13.97 5.92 6.42 0.00 1.50 0.13 0.00 0.00 Gm/Hr) 0.00 0.00 0.00	Altii mbient 1 rating) eriod 2 LDDV 15.0 0.000 0.80 0.80 0.80 0.00 0.00 0.00	tude: 5 femp: kode: femp: 9 RVP: 1 LDDT 15.0 0.000 1.07 1.07 1.07 0.00 0.00 0.00 0	500. Ft. 75.0 / 0.0 / 1. (F) 1.5 Peri HDDV 15.0 0.130 3.09 3.09 16.06 17.64 17.37 51.18 22.32	75.0 / 0.0 / mc 15.0 0.000 6.27 2.33 3.48 0.46 0.00 0.00 0.00 0.00 0.00	75.0 F 0.0 (r: 1988 All Veh 3.56 1.64 1.04 0.00 0.79 0.10 20.55 3.14 23.37 261.65 5.43

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	and the second se	the second s									
Cal. Ye	ear:	1992		Region	: Low		Altii	ude: 5	00. Ft.		
			1/M	Program	: No	Ал	nbient 1	emp:	75.0 /	75.0 /	75.0 F
		Ant	ti-tam.	Program	: No	Oper	ating)	lode:	0.0 /	0.0 /	0.0
16.2mm	75F	0205									
10.2.10		0.000	Minin		. 50	(F) Ma	vinum 1	emo: 91	(E)		
			Deric		. 11 5		rind 2	DVD- 11	5 Peri	od 2 V	r · 1988
Vab T		I DOV	IDCT1			HDCV			HODY		ALL Vob
ven. Ty	pe:	LDGV	LUGII	LUGIZ	LUGI	NDGV	LDUV	LUUT	NUUV	пс	ALL VEN
Val Ca		16.2	16.7	16.2		16.7	16.2	16.2	16.2	16.2	
ven. sp	30.:	10.2	10.2	0.2		10.2	10.2	10.2	10.2	10.2	
	11X:	0.8/0	0.000	0.000		0.000	0.000	0.000	0.150	0.000	
Composi	ITE L	mission	1 Factor	rs (Gm/M	1(e)			4			7 / 0
Total	HC:	3.4/	4.18	5.85	0.00	13.3/	0.76	1.02	2.94	0.14	3.40
Exhst	HC:	1.34	2.05	2.67	0.00	5.44	0.76	1.02	2.94	2.19	1.55
Evap.	HC:	1.20	1.29	2.17	0.00	6.42				3.48	1.04
Refuel	HC:	0.00	0.00	0.00	0.00	0.00					0.00
Runing	HC:	0.83	0.74	0.91	0.00	1.39					0.72
Rsting	HC:	0.11	0.09	0.10	0.00	0.13				0.46	0.10
Exhst	CO:	19.41	0.00	0.00	0.00	0.00	0.00	0.00	14.95	0.00	18.83
Exhst N	NOX:	0.97	0.00	0.00	0.00	0.00	0.00	0.00	17.10	0.00	3.07
Hot Sta	abili	zed Id	le Emiss	sion Fac	tors (Gm/Hr)					
Idle	HC:	24.27	0.00	0.00	0.00	0.00	0.00	0.00	17.37	0.00	23.37
Idle	CO:2	93.10	0.00	0.00	0.00	0.00	0.00	0.00	51.18	0.00	261.65
Idle N	NOX:	2.90	0.00	0.00	0.00	0.00	0.00	0.00	22.32	0.00	5.43
Cal. Ye	ear:	1992		Region	: Low		Alti	tude:	500. Ft.		
Cal. Ye	ear:	1992	1/M	Region Program	: Low : No	Ar	Alti	tude: ! Temp:	500. Ft. 75.0 /	75.0	75.0 F
Cal. Ye	ear:	1992 Ani	I/M ti-tam.	Region Program Program	: Low : No : No	Ar Oper	Alti mbient rating	tude: ! Temp: Node:	500. Ft. 75.0 / 0.0 /	75.0 /	75.0 F
Cal. Ye	ear: h 75F	1992 Ant 0%CS	I/M ti-tam.	Region Program Program	: Low : No : No	Ar Oper	Alti mbient rating	tude: ! Temp: Node:	500. Ft. 75.0 / 0.0 /	75.0 / 0.0 /	75.0 F 0.0
Cal. Ye	ear: h 75F	1992 Ant 0%CS	I/M ti-tam. Minin	Region Program Program	: Low : No : No : 59.	Ar Oper	Alti mbient rating l aximum	tude: ! Temp: Node: Temp: 9	500. Ft. 75.0 / 0.0 /	75.0 / 0.0 /	75.0 F 0.0
Cal. Ye	ear: h 75F	1992 Ani 0%CS	I/M ti-tam. Minin Perio	Region Program Program mum Temp od 1 RVP	: Low : No : No : 59. : 11.5	Ar Oper (F) Ma	Alti mbient rating aximum eriod 2	tude: ! Temp: Mode: Temp: 9' RVP: 1	500. Ft. 75.0 / 0.0 / 1. (F)	75.0 / 0.0 /	75.0 F
Cal. Ye 17.5mpt	ear: h 75F	1992 Ant 0%CS	I/M ti-tam. Minin Perio	Region Program Program mum Temp od 1 RVP	: Low : No : No : 59. : 11.5	Ar Oper (F) Ma Pr	Alti mbient rating l aximum eriod 2	tude: ! Temp: Node: Temp: 9' RVP: 1'	500. Ft. 75.0 / 0.0 / 1. (F) 1.5 Peri HDDV	75.0 / 0.0 / od 2 1	75.0 F 0.0 71: 1988
Cal. Ye 17.5mph Veh. Ty	ear: h 75F ype:	1992 Ani 0%CS LDGV	I/M ti-tam. Minin Perio LDGT1	Region Program Program mum Temp od 1 RVP LDGT2	: Low : No : No : 59. : 11.5 LDGT	Ar Oper (F) Ma Pr HDGV	Alti mbient rating l aximum eriod 2 LDDV	tude: ! Temp: Node: Temp: 9' RVP: 1' LDDT	500. Ft. 75.0 / 0.0 / 1. (F) 1.5 Peri HDDV	75.0 / 0.0 / od 2 1 MC	75.0 F 0.0 7: 1988 All Veh
Cal. Ye 17.5mph Veh. Ty	ear: h 75F ype:	1992 Ant 0%CS LDGV	I/M ti-tam. Minin Perio LDGT1	Region Program Program mum Temp od 1 RVP LDGT2	: Low : No : No : 59. : 11.5 LDGT	Ar Oper (F) Ma Pr HDGV	Alti mbient rating l aximum eriod 2 LDDV	tude: ! Temp: Hode: Temp: 9' RVP: 1' LDDT	500. Ft. 75.0 / 0.0 / 1. (F) 1.5 Peri HDDV	75.0 / 0.0 / od 2 1 MC	75.0 F 0.0 7: 1988 All Veh
Cal. Ye 17.5mph Veh. Ty Veh. Sp	ear: h 75F ype: pd.:	1992 Ani 0%CS LDGV	I/M ti-tam. Minin Perio LDGT1 17.5	Region Program Program mum Temp od 1 RVP LDGT2 17.5	: Low : No : No : 59. : 11.5 LDGT	Ar Oper (F) Ma Pr HDGV 17.5	Altimbient rating l aximum eriod 2 LDDV	tude: ! Temp: Hode: Temp: 9' RVP: 1' LDDT 17.5	500. Ft. 75.0 / 0.0 / 1. (F) 1.5 Peri HDDV 17.5	75.0 / 0.0 / od 2 1 MC	75.0 F 0.0 7: 1988 All Veh
Cal. Ye 17.5mph Veh. Ty Veh. Sp VMT M	ear: h 75F ype: pd.: Mix:	1992 Ani 0%CS LDGV 17.5 0.870	I/M ti-tam. Minin Perio LDGT1 17.5 0.000	Region Program Program mum Temp od 1 RVP LDGT2 17.5 0.000	: Low :: No :: S9. :: 11.5 LDGT	Ar Oper (F) Ma Pd HDGV 17.5 0.000	Alti mbient rating l aximum eriod 2 LDDV 17.5 0.000	tude: 9 Temp: 9 RVP: 1 LDDT 17.5 0.000	500. Ft. 75.0 / 0.0 / 1. (F) 1.5 Peri HDDV 17.5 0.130	75.0 / 0.0 / od 2 1 MC 17.5 0.000	75.0 F 0.0 7r: 1988 All Veh
Cal. Ye 17.5mph Veh. Ty Veh. Sp VmT S Composit	ear: h 75F ype: pd.: Mix: ite E	1992 Ani 0%CS LDGV 17.5 0.870 mission	I/M ti-tam. Minin Perio LDGT1 17.5 0.000 Factor	Region Program Program mum Temp od 1 RVP LDGT2 17.5 0.000 rs (Gm/M	: Low : No : No : 59. : 11.5 LDGT	Ar Oper (F) Ma HDGV 17.5 0.000	Alti mbient rating f aximum eriod 2 LDDV 17.5 0.000	tude: ! Temp: Node: Temp: 9' RVP: 1' LDDT 17.5 0.000	500. Ft. 75.0 / 0.0 / 1. (F) 1.5 Peri HDDV 17.5 0.130	75.0 / 0.0 / od 2 1 MC 17.5 0.000	75.0 F 0.0 7r: 1988 All Veh
Cal. Ye 17.5mph Veh. Ty Veh. Sp VMT N Composi Total	ear: h 75F ype: pd.: Mix: ite E HC:	1992 Ani 0%CS LDGV 17.5 0.870 3.32	I/M ti-tam. Minin Perio LDGT1 17.5 0.000 Facton 3.98	Region Program Program mum Temp od 1 RVP LDGT2 17.5 0.000 rs (Gm/M 5.60	: Low : No : S9. : 11.5 LDGT ile) 0.00	Ar Oper (F) Mr HDGV 17.5 0.000 12.79	Alti nating l aximum eriod 2 LDDV 17.5 0.000 0.72	tude: ! Temp: Hode: Temp: 9 RVP: 1 LDDT 17.5 0.000 0.97	500. Ft. 75.0 / 0.0 / 1. (F) 1.5 Peri HDDV 17.5 0.130 2.79	75.0 / 0.0 / od 2 1 MC 17.5 0.000 6.01	75.0 F 0.0 7: 1988 All Veh 3.25
Cal. Ye 17.5mph Veh. Ty Veh. Sp VMT M Composi Total Exhst	ear: ype: yd.: fix: ite E HC: HC:	1992 Ani 0xcs LDGV 17.5 0.870 3.32 1.26	I/M ti-tam. Minin Perio LDGT1 17.5 0.000 n Factor 3.98 1.93	Region Program Program mum Temp od 1 RVP LDGT2 17.5 0.000 rs (Gm/M 5.60 2.51	: Low : No : S9. : 11.5 LDGT ile) 0.00 0.00	Ar Oper (F) H, HDGV 17.5 0.000 12.79 4.97	Alti nating l aximum eriod 2 LDDV 17.5 0.000 0.72 0.72	tude: ! Temp: Node: Temp: 9 RVP: 1 LDDT 17.5 0.000 0.97 0.97	500. Ft. 75.0 / 0.0 / 1. (F) 1.5 Peri HDDV 17.5 0.130 2.79 2.79	75.0 / 0.0 / od 2 1 MC 17.5 0.000 6.01 2.07	75.0 F 0.0 7r: 1988 All Veh 3.25 1.46
Cal. Ye 17.5mph Veh. Ty Veh. Sp VMT M Composi Total Exhst Evap.	ear: ype: pd.: fix: ite E HC: HC: HC:	1992 Anti 0%CS LDGV 17.5 0.870 mission 3.32 1.26 1.20	I/M ti-tam. Minin Perio LDGT1 17.5 0.000 n Factor 3.98 1.93 1.29	Region Program Program mum Temp od 1 RVP LDGT2 17.5 0.000 rs (Gm/M 5.60 2.51 2.17	: Low : No : No : 59. : 11.5 LDGT ile) 0.00 0.00 0.00	Ar Oper (F) H HDGV 17.5 0.000 12.79 4.97 6.42	Alti mbient rating l aximum eriod 2 LDDV 17.5 0.000 0.72 0.72	tude: ! Temp: Hode: Temp: 9 RVP: 1 LDDT 17.5 0.000 0.97 0.97	500. Ft. 75.0 / 0.0 / 1. (F) 1.5 Peri HDDV 17.5 0.130 2.79 2.79	75.0 / 0.0 / od 2 1 MC 17.5 0.000 6.01 2.07 3.48	75.0 F 0.0 7r: 1988 All Veh 3.25 1.46 1.04
Cal. Ye 17.5mph Veh. Ty Veh. Sp VMT M Composi Total Exhst Evap. Refuel	ear: ype: pd.: hC: HC: HC: HC:	1992 Ant 0%CS LDGV 17.5 0.870 mission 3.32 1.26 1.20 0.00	I/M ti-tam. Minin Perio LDGT1 17.5 0.000 n Factor 3.98 1.93 1.29 0.00	Region Program Program num Temp od 1 RVP LDGT2 17.5 0.000 rs (Gm/M 5.60 2.51 2.17 0.00	: Low : No : S9. : 11.5 LDGT ile) 0.00 0.00 0.00 0.00	Ar Oper (F) H- HDGV 17.5 0.000 12.79 4.97 6.42 0.00	Alti mbient rating l aximum eriod 2 LDDV 17.5 0.000 0.72 0.72	tude: ! Temp: Hode: Temp: 9 RVP: 1 LDDT 17.5 0.000 0.97 0.97	500. Ft. 75.0 / 0.0 / 1. (F) 1.5 Peri HDDV 17.5 0.130 2.79 2.79	75.0 / 0.0 / od 2 1 MC 17.5 0.000 6.01 2.07 3.48	75.0 F 0.0 7r: 1988 All Veh 3.25 1.46 1.04 0.00
Cal. Ye 17.5mph Veh. Ty Veh. Sp VHT N Composi Total Exhst Evap. Refuel Runing	ear: h 75F ype: pd.: ite E HC: HC: HC: HC: HC:	1992 Ant 0%CS LDGV 17.5 0.870 mission 3.32 1.26 1.20 0.00 0.75	I/M ti-tam. Minin Perio LDGT1 17.5 0.000 n Factor 3.98 1.93 1.29 0.00 0.66	Region Program Program num Temp od 1 RVP LDGT2 17.5 0.000 rs (Gm/M 5.60 2.51 2.17 0.00 0.82	: Low : No : S9. : 11.5 LDGT ile) 0.00 0.00 0.00 0.00	Ar Oper (F) Mi P(HDGV 17.5 0.000 12.79 4.97 6.42 0.00 1.27	Alti mbient rating l aximum eriod 2 LDDV 17.5 0.000 0.72 0.72	tude: ! Temp: Hode: Temp: 9 RVP: 1 LDDT 17.5 0.000 0.97 0.97	500. Ft. 75.0 / 0.0 / 1. (F) 1.5 Peri HDDV 17.5 0.130 2.79 2.79	75.0 / 0.0 / od 2 1 MC 17.5 0.000 6.01 2.07 3.48	75.0 F 0.0 7r: 1988 All Veh 3.25 1.46 1.04 0.00 0.65
Cal. Ye 17.5mph Veh. Ty Veh. Sp VMT M Composi Total Exhst Evap. Refuel Runing Rsting	wype: yype: d.: Mix: ite E HC: HC: HC: HC: HC: HC: HC: HC:	1992 Ant 0%CS LDGV 17.5 0.870 3.32 1.26 1.20 0.00 0.75 0.11	I/M ti-tam. Minin Perio LDGT1 17.5 0.000 n Factor 3.98 1.93 1.29 0.00 0.66 0.09	Region Program Program mum Temp od 1 RVP LDGT2 17.5 0.000 rs (Gm/M 5.60 2.51 2.17 0.00 0.82 0.10	: Low : No : S9. : 11.5 LDGT 0.00 0.00 0.00 0.00 0.00 0.00	Ar Oper (F) Mi Pr HDGV 17.5 0.000 12.79 4.97 6.42 0.00 1.27 0.13	Altimbient rating l aximum eriod 2 LDDV 17.5 0.000 0.72 0.72	tude: ! Temp: Hode: Temp: 9' RVP: 1' LDDT 17.5 0.000 0.97 0.97	500. Ft. 75.0 / 0.0 / 1. (F) 1.5 Peri HDDV 17.5 0.130 2.79 2.79	75.0 / 0.0 / od 2 1 MC 17.5 0.000 6.01 2.07 3.48 0.46	75.0 F 0.0 7r: 1988 All Veh 3.25 1.46 1.04 0.00 0.65 0.10
Cal. Ye 17.5mph Veh. Ty Veh. Sp VMT N Composi Total Exhst Refuel Runing Rsting Exhst	ear: h 75F pd.: HC: HC: HC: HC: HC: CO:	1992 Anti 0xCS LDGV 17.5 0.870 mission 3.32 1.26 1.20 0.00 0.75 0.11 17.73	I/M ti-tam. Minin Perio LDGT1 17.5 0.000 Factor 3.98 1.93 1.29 0.00 0.66 0.09 0.00	Region Program Program mum Temp dd 1 RVP LDGT2 17.5 0.000 rs (Gm/M 5.60 2.51 2.17 0.00 0.82 0.10 0.00	: Low : No : S9. : 11.5 LDGT 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00	Ar Oper (F) Mi Pr HDGV 17.5 0.000 12.79 4.97 6.42 0.00 1.27 0.13 0.00	Altimbient rating l aximum eriod 2 LDDV 17.5 0.000 0.72 0.72 0.72	tude: ! Temp: Node: Temp: 9' RVP: 1' LDDT 17.5 0.000 0.97 0.97	500. Ft. 75.0 / 0.0 / 1.5 Peri HDDV 17.5 0.130 2.79 2.79	75.0 / 0.0 / MC 17.5 0.000 6.01 2.07 3.48 0.46 0.00	75.0 F 0.0 7r: 1988 All Veh 3.25 1.46 1.04 0.00 0.65 0.10 17.23
Cal. Ye 17.5mph Veh. Ty Veh. Sp VMT N Composi Total Exhst Evap. Refuel Runing Rsting Exhst	ype: pd.: HC: HC: HC: HC: HC: HC: NOX:	1992 Anti 0xCS LDGV 17.5 0.870 3.32 1.26 1.20 0.00 0.75 0.11 17.73 0.97	I/M ti-tam. Minin Perio LDGT1 17.5 0.000 n Factor 3.98 1.93 1.29 0.00 0.66 0.09 0.00 0.00	Region Program Program mum Temp od 1 RVP LDGT2 17.5 0.000 rs (Gm/M 5.60 2.51 2.17 0.00 0.82 0.10 0.00 0.00	:: Low :: No :: No :: 59. : 11.5 LDGT 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00	Ar Oper (F) Mi HDGV 17.5 0.000 12.79 4.97 6.42 0.00 1.27 0.13 0.00 0.00	Alti mbient rating l aximum eriod 2 LDDV 17.5 0.000 0.72 0.72 0.72 0.00 0.00	tude: ! Temp: % Node: Temp: % RVP: 1 LDDT 17.5 0.000 0.97 0.97 0.97	500. Ft. 75.0 / 0.0 / 1. (F) 1.5 Peri HDDV 17.5 0.130 2.79 2.79 13.88 16.57	75.0 / 0.0 / od 2 1 MC 17.5 0.000 6.01 2.07 3.48 0.46 0.00 0.00	75.0 F 0.0 7r: 1988 All Veh 3.25 1.46 1.04 0.00 0.65 0.10 17.23 2.99
Cal. Ye 17.5mph Veh. Ty Veh. Sp VMT N Composi Total Exhst Evap. Refuel Runing Rsting Exhst Hot Sta	ype: ype: nd.: fite E HC: HC: HC: HC: HC: HC: HC: HC: HC: HC:	1992 Anti 0xcs LDGV 17.5 0.870 imission 3.32 1.26 1.20 0.00 0.75 0.11 17.73 0.97 zed Id	I/M ti-tam. Minin Perio LDGT1 17.5 0.000 n Facton 3.98 1.93 1.29 0.00 0.66 0.09 0.00 0.00 le Emiss	Region Program Program mum Temp od 1 RVP LDGT2 17.5 0.000 rs (Gm/M 5.60 2.51 2.51 2.51 0.00 0.82 0.10 0.00 0.82 0.10 0.00 0.00 0.00 0.00	: Low : No : No : S9. : 11.5 LDGT 0.000 0.00 0.	Ar Oper (F) Ma HDGV 17.5 0.000 12.79 4.97 6.42 0.00 1.27 0.13 0.00 0.00 Gm/Hr)	Alti mbient rating l aximum eriod 2 LDDV 17.5 0.000 0.72 0.72 0.72 0.00 0.00	tude: ! Temp: Node: Temp: 9 RVP: 1 LDDT 17.5 0.000 0.97 0.97 0.97	500. Ft. 75.0 / 0.0 / 1. (F) 1.5 Peri HDDV 17.5 0.130 2.79 2.79 13.88 16.57	75.0 / 0.0 / od 2 1 MC 17.5 0.000 6.01 2.07 3.48 0.46 0.00 0.00	75.0 F 0.0 7r: 1988 All Veh 3.25 1.46 1.04 0.65 0.10 17.23 2.99
Cal. Ye 17.5mph Veh. Ty Veh. Sp VMT M Composi Total Exhst Evap. Refuel Runing Rsting Exhst Exhst Hot Sta Idle	ype: pd.: HC: HC: HC: HC: HC: HC: HC: HC	1992 Anti 0%CS LDGV 17.5 0.870 3.32 1.26 1.20 0.00 0.75 0.11 17.73 0.97 zed Id 24.27	I/M ti-tam. Minin Perio LDGT1 17.5 0.000 n Factor 3.98 1.93 1.29 0.00 0.66 0.09 0.00 0.00 le Emiss 0.00	Region Program Program mum Temp od 1 RVP LDGT2 17.5 0.000 rs (Gm/M 5.60 2.51 2.17 0.00 0.82 0.10 0.00 0.00 sion Fac 0.00	: Low : No : No : S9. : 11.5 LDGT 0.00 0.	Ar Oper (F) Ha HDGV 17.5 0.000 12.79 4.97 6.42 0.00 1.27 0.13 0.00 0.00 Gm/Hr) 0.00	Alti mbient rating l aximum eriod 2 LDDV 17.5 0.000 0.72 0.72 0.72 0.00 0.00 0.00	tude: ! Temp: Node: Temp: 9' RVP: 1' LDDT 17.5 0.000 0.97 0.97 0.97 0.00 0.00 0.00	500. Ft. 75.0 / 0.0 / 1. (F) 1.5 Peri HDDV 17.5 0.130 2.79 2.79 13.88 16.57 17.37	75.0 / 0.0 / 0.0 / 0.0 / 17.5 0.000 6.01 2.07 3.48 0.46 0.00 0.00 0.00	75.0 F 0.0 7: 1988 All Veh 3.25 1.46 1.04 0.05 0.10 17.23 2.99 23.37
Cal. Ye 17.5mph Veh. Ty Veh. Sp VMT + Composi Total Exhst Evap. Refuel Runing Rsting Exhst Exhst + Hot Sta Idle Idle	ype: pd.: Hix: HC: HC: HC: HC: HC: HC: HC: HC: HC: CO: 20: 20: 20: 20: 20: 20: 20: 20: 20: 20	1992 Anti 0%CS LDGV 17.5 0.870 3.32 1.26 1.20 0.00 0.75 0.11 17.73 0.97 zed Id 24.27 93.10	I/M ti-tam. Minin Perio LDGT1 17.5 0.000 n Factor 3.98 1.93 1.29 0.00 0.66 0.00 0.00 0.00 le Emiss 0.00 0.00	Region Program Program mum Tempod 1 RVP LDGT2 17.5 0.000 rs (Gm/M 5.60 2.51 2.17 0.00 0.82 0.10 0.00 0.00 sion Fac 0.00 0.00	: Low : No : No : S9. : 11.5 LDGT 0.00	Ar Oper (F) Hr HDGV 17.5 0.000 12.79 4.97 6.42 0.00 1.27 0.13 0.00 0.00 Gm/Hr) 0.00 0.00	Alti mbient rating l aximum eriod 2 LDDV 17.5 0.000 0.72 0.72 0.72 0.00 0.00 0.00 0.0	tude: ! Temp: % Node: Temp: 9 RVP: 1 LDDT 17.5 0.000 0.97 0.97 0.97 0.00 0.00 0.00 0.0	500. Ft. 75.0 / 0.0 / 1. (F) 1.5 Peri HDDV 17.5 0.130 2.79 2.79 13.88 16.57 17.37 51.18	75.0 / 0.0 / 0.0 / 0.0 / 17.5 0.000 6.01 2.07 3.48 0.46 0.00 0.00 0.00	75.0 F 0.0 7: 1988 All Veh 3.25 1.46 1.04 0.00 0.65 0.10 17.23 2.99 23.37 261.65
Cal. Ye 17.5mph Veh. Ty Veh. Sp VHT N Composi Total Exhst Evap. Refuel Runing Rsting Exhst Hot Sta Idle Idle	wype: pd.: Mix: ite E HC: HC: HC: HC: CO: NOX: AC: NOX: NOX:	1992 Anti 0%CS LDGV 17.5 0.870 mission 3.32 1.26 1.20 0.00 0.75 0.11 17.73 0.97 zed Id 24.27 93.10 2.90	I/M ti-tam. Minin Perio LDGT1 17.5 0.000 n Factor 3.98 1.93 1.29 0.00 0.66 0.09 0.00 0.00 0.00 0.00 0.0	Region Program Program mum Temp od 1 RVP LDGT2 17.5 0.000 rs (Gm/M 5.60 2.51 2.17 0.00 0.82 0.10 0.00 0.00 0.00 0.00 0.00	: Low : No : No : S9. : 11.5 LDGT 0.00	Ar Oper (F) Hr HDGV 17.5 0.000 12.79 4.97 6.42 0.00 1.27 0.13 0.00 0.00 Gm/Hr) 0.00 0.00	Alti mbient rating l aximum eriod 2 LDDV 17.5 0.000 0.72 0.72 0.72 0.00 0.00 0.00 0.0	tude: ! Temp: 9 Node: Temp: 9 RVP: 1 LDDT 17.5 0.000 0.97 0.97 0.97 0.00 0.00 0.00 0.0	500. Ft. 75.0 / 0.0 / 1. (F) 1.5 Peri HDDV 17.5 0.130 2.79 2.79 13.88 16.57 17.37 51.18 22.32	75.0 / 0.0 / 0.0 / MC 17.5 0.000 6.01 2.07 3.48 0.46 0.00 0.00 0.00 0.00 0.00	75.0 F 0.0 7: 1988 All Veh 3.25 1.46 1.04 0.00 0.65 0.10 17.23 2.99 23.37 261.65 5.43

Contract of the local division of the local										
Cal. Year:	1992	· .	Region	: Low		Alti	tude:	500. Ft		
		1/M	Program	n: No	Ar	nbient 1	Temp:	75.0 /	75.0	75.0 F
	An	ti-tam.	Program	n: No	Oper	rating	lode:	0.0 /	0.0 /	0.0
20.0mph 75	F 0%CS									
		Mini	mum Temp	o: 59.	(F) Ma	aximum	Temp: 9	1. (F)		
		Peri	od 1 RVP	11.5	P	eriod 2	RVP: 1	1.5 Per	iod 2 1	r: 1988
Veh. Type:	LDGV	LDGT1	LDGT2	LDGT	HDGV	LDDV	LDDT	HDDV	MC	All Veh
Veh. Spd. :	20.0	20.0	20.0		20.0	20.0	20.0	20.0	20.0	
VMT Mix:	0.870	0.000	0.000		0.000	0.000	0.000	0.130	0.000)
Composite I	Emissio	n Facto	rs (Gm/M	lile)						
Total HC:	3.03	3.54	5.05	0.00	11.86	0.65	0.88	2.53	5.83	2.97
Exhst HC:	1.10	1.63	2.11	0.00	4.21	0.65	0.88	2.53	1.89	1.28
Evap. HC:	1.20	1.29	2.17	0.00	6.42				3,48	1.04
Refuel HC:	0.00	0.00	0.00	0.00	0.00					0.00
Runing HC:	0.63	0.53	0.67	0.00	1.09					0.55
Rsting HC:	0.11	0.09	0.10	0.00	0.13				0.46	0.10
Exhst CO:	15.27	0.00	0.00	0.00	0.00	0.00	0.00	12.13	0.00	14.86
Exhst NOX:	0.89	0.00	0.00	0.00	0.00	0.00	0.00	15.71	0.00	2.82
Hot Stabil	ized Id	le Emis	sion Fac	tors (Gm/Hr)					
Idle HC:	24.27	0.00	0.00	0.00	0.00	0.00	0.00	17.37	0.00	23.37
Idle CO:2	293.10	0.00	0.00	0.00	0.00	0.00	0.00	51.18	0.00	261.65
Idle NOX:	2.90	0.00	0.00	0.00	0.00	0.00	0.00	22.32	0.00	5.43
where we want the state of the										
Cal. Year:	1992		Region	: Low		Alti	tude:	500. Ft.		
Cal. Year:	1992	1/M	Region Program	: Low : No	An	Alti abient 1	tude: ! Temp:	500. Ft. 75.0 /	75.0 /	75.0 F
Cal. Year:	1992 An	I/M ti-tam.	Region Program Program	: Low : No : No	Ar Oper	Altin mbient 1 rating P	tude: ! Temp: Mode:	500. Ft 75.0 / 0.0 /	75.0 / 0.0 /	75.0 F
Cal. Year: 22.5mph 751	1992 An: 0%CS	I/M ti-tam.	Region Program Program	i: Low i: No i: No	An Open	Altin mbient 1 rating P	tude: Temp: Mode:	500. Ft 75.0 / 0.0 /	75.0 / 0.0 /	75.0 F 0.0
Cal. Year: 22.5mph 751	1992 An: 0%CS	I/M ti-tam. Miniu	Region Program Program mum Temp	1: Low 1: No 1: No 1: No	An Oper (F) Ma	Altin nbient 1 rating M aximum 1	tude: : Temp: Node: Temp: 9	500. Ft 75.0 / 0.0 / 1. (F)	75.0 / 0.0 /	75.0 F 0.0
Cal. Year: 22.5mph 751	1992 An: 0%CS	I/M ti-tam. Minin Perio	Region Program Program mum Temp od 1 RVP	1: Low 1: No 1: No 1: 59. 11.5	An Oper (F) Ma Pe	Altin nbient 1 rating P aximum 1 eriod 2	tude: Temp: Node: Temp: 9 RVP: 1	500. Ft. 75.0 / 0.0 / 1. (F) 1.5 Per	75.0 / 0.0 /	75.0 F 0.0
Cal. Year: 22.5mph 751 Veh. Type:	1992 An: 0XCS LDGV	I/M ti-tam. Miniu Perio LDGT1	Region Program Program mum Temp od 1 RVP LDGT2	1: Low 1: No 1: No 1: 59. 11.5 LDGT	An Oper (F) Ma Pe HDGV	Altin mbient 1 rating P aximum 1 eriod 2 LDDV	tude: Temp: Node: Temp: 9 RVP: 1 LDDT	500. Ft 75.0 / 0.0 / 1. (F) 1.5 Per HDDV	75.0 / 0.0 / iod 2 1 MC	75.0 F 0.0 7: 1988 All Veh
Cal. Year: 22.5mph 751 Veh. Type: Veh. Spd.:	1992 Ani 0xcs LDGV 22.5	I/M ti-tam. Minin Perio LDGT1 22.5	Region Program Program mum Temp od 1 RVP LDGT2 22.5	1: Low 1: No 1: No 1: 59. 11.5 LDGT	An Oper (F) Ma Po HDGV	Altin nbient 1 rating P aximum 1 eriod 2 LDDV	tude: Temp: Mode: Temp: 9 RVP: 1 LDDT 22.5	500. Ft 75.0 / 0.0 / 1. (F) 1.5 Per HDDV	75.0 / 0.0 / iod 2 1 MC	75.0 F 0.0 7: 1988 All Veh
Cal. Year: 22.5mph 751 Veh. Type: Veh. Spd.: VMT Wix:	1992 Ani 0xcs LDGV 22.5 0.870	I/M ti-tam. Minin Perin LDGT1 22.5 0.000	Region Program Program num Temp od 1 RVP LDGT2 22.5 0.000	1: Low 1: No 1: No 1: 59. 11.5 LDGT	An Oper (F) Ma Po HDGV 22.5 0.000	Altin mbient 1 rating P aximum 1 eriod 2 LDDV 22.5 0.000	tude: Temp: Mode: Temp: 9' RVP: 1' LDDT 22.5 0.000	500. Ft 75.0 / 0.0 / 1. (F) 1.5 Per HDDV 22.5 0.130	75.0 / 0.0 / MC 22.5 0.000	775.0 F 70.0 7r: 1988 All Veh
Cal. Year: 22.5mph 751 Veh. Type: Veh. Spd.: VMT Mix: Composite E	1992 Ani 0XCS LDGV 22.5 0.870 mission	I/M ti-tam. Minin Perio LDGT1 22.5 0.000 n Factor	Region Program Program mum Temp od 1 RVP LDGT2 22.5 0.000 rs (Gm/M	:: Low :: No :: No :: 59. :: 11.5 LDGT ile)	An Oper (F) Ma Po HDGV 22.5 0.000	Altiin notient 1 rating P eriod 2 LDDV 22.5 0.000	tude: Temp: Mode: Temp: 9 RVP: 1 LDDT 22.5 0.000	500. Ft. 75.0 / 0.0 / 1. (F) 1.5 Per HDDV 22.5 0.130	75.0 / 0.0 / iod 2 1 MC 22.5 0.000	775.0 F 7 0.0 7r: 1988 All Veh
Cal. Year: 22.5mph 751 Veh. Type: Veh. Spd.: VMT Mix: Composite E Total HC:	1992 An: 0XCS LDGV 22.5 0.870 mission 2.85	I/M ti-tam. Minin Perin LDGT1 22.5 0.000 n Facton 3.28	Region Program Program od 1 RVP LDGT2 22.5 0.000 rs (Gm/M 4.72	:: Low :: No :: No :: 59. : 11.5 LDGT 	An Oper (F) Ha Po HDGV 22.5 0.000 11.13	Altiin nbient 1 rating P aximum 1 eriod 2 LDDV 22.5 0.000 0.60	tude: 1 Temp: Mode: Temp: 9 RVP: 1 LDDT 22.5 0.000 0.80	500. Ft. 75.0 / 0.0 / 1. (F) 1.5 Per HDDV 22.5 0.130 2.31	75.0 / 0.0 / iod 2) MC 22.5 0.000 5.68	75.0 F 0.0 (r: 1988 All Veh 2.78
Cal. Year: 22.5mph 751 Veh. Type: Veh. Spd.: VMT Mix: Composite E Total HC: Exhst HC:	1992 Ann 0XCS LDGV 22.5 0.870 2.85 0.98	I/M ti-tam. Minin Perio LDGT1 22.5 0.000 n Factor 3.28 1.43	Region Program Program mum Temp od 1 RVP LDGT2 22.5 0.000 rs (Gm/M 4.72 1.85	:: Low :: No :: No :: 59. :: 11.5 LDGT 	An Oper (F) Ma PC HDGV 22.5 0.000 11.13 3.61	Altin hbient 1 ating P aximum 1 eriod 2 LDDV 22.5 0.000 0.60 0.60	tude: femp: formp: 9 RVP: 1 LDDT 22.5 0.000 0.80 0.80	500. Ft. 75.0 / 0.0 / 1. (F) 1.5 Per HDDV 22.5 0.130 2.31 2.31	75.0 / 0.0 / iod 2) MC 22.5 0.000 5.68 1.74	775.0 F 70.0 7r: 1988 All Veh 2.78 1.16
Cal. Year: 22.5mph 75 Veh. Type: Veh. Spd.: VMT Mix: Composite E Total HC: Exhst HC: Evap. HC:	1992 Ann 0%CS LDGV 22.5 0.870 2.85 0.98 1.20	I/M ti-tam. Minin Perio LDGT1 22.5 0.000 n Factor 3.28 1.43 1.29	Region Program Program num Temp od 1 RVP LDGT2 22.5 0.000 rs (Gm/M 4.72 1.85 2.17	:: Low :: No :: 59. :: 11.5 LDGT 	An Oper (F) Ma PC HDGV 22.5 0.000 11.13 3.61 6.42	Altin hbient 1 rating P aximum 1 eriod 2 LDDV 22.5 0.000 0.60 0.60	tude: 1 Temp: Node: Temp: 9 RVP: 1 LDDT 22.5 0.000 0.80 0.80	500. Ft. 75.0 / 0.0 / 1. (F) 1.5 Per HDDV 22.5 0.130 2.31 2.31	75.0 / 0.0 / MC 22.5 0.000 5.68 1.74 3.48	775.0 F 70.0 7r: 1988 All Veh 2.78 1.16 1.04
Cal. Year: 22.5mph 75 Veh. Type: Veh. Spd.: VMT Mix: Composite E Total HC: Exhst HC: Evap. HC: Refuel HC:	1992 Ann 0XCS LDGV 22.5 0.870 2.85 0.98 1.20 0.00	I/M ti-tam. Minin Perio LDGT1 22.5 0.000 n Factor 3.28 1.43 1.29 0.00	Region Program Program mum Temp od 1 RVP LDGT2 22.5 0.000 rs (Gm/M 4.72 1.85 2.17 0.00	i: Low i: No i: No i: 59. i: 11.5 LDGT ile) 0.00 0.00 0.00 0.00	An Oper (F) Ma PC HDGV 22.5 0.000 11.13 3.61 6.42 0.00	Altin hbient 1 rating P aximum 1 eriod 2 LDDV 22.5 0.000 0.60 0.60	tude: 1 Temp: Node: RVP: 1 LDDT 22.5 0.000 0.80 0.80	500. Ft. 75.0 / 0.0 / 1. (F) 1.5 Per HDDV 22.5 0.130 2.31 2.31	75.0 / 0.0 / iod 2 1 MC 22.5 0.000 5.68 1.74 3.48	775.0 F 70.0 7r: 1988 All Veh 2.78 1.16 1.04 0.00
Cal. Year: 22.5mph 75 Veh. Type: Veh. Spd.: VMT Mix: Composite E Total HC: Exhst HC: Evap. HC: Refuel HC: Runing HC:	1992 An: 0XCS LDGV 22.5 0.870 2.85 0.98 1.20 0.00 0.56	I/M ti-tam. Minin Perio LDGT1 22.5 0.000 n Factor 3.28 1.43 1.29 0.00 0.47	Region Program Program mum Tempo d 1 RVP LDGT2 22.5 0.000 rs (Gm/M 4.72 1.85 2.17 0.00 0.60	L: Low L: No L: No L: 59. LDGT 0.00 0.00 0.00 0.00 0.00	Ar Oper (F) Ma PC HDGV 22.5 0.000 11.13 3.61 6.42 0.00 0.98	Altin hbient 1 rating P aximum 1 eriod 2 LDDV 	tude: 1 Temp: Node: RVP: 1 LDDT 22.5 0.000 0.80 0.80	500. Ft. 75.0 / 0.0 / 1. (F) 1.5 Per HDDV 22.5 0.130 2.31 2.31	75.0 / 0.0 / iod 2 1 MC 22.5 0.000 5.68 1.74 3.48	775.0 F 70.0 7r: 1988 All Veh 2.78 1.16 1.04 0.00 0.49
Cal. Year: 22.5mph 75 Veh. Type: Veh. Spd.: VMT Mix: Composite E Total HC: Exhst HC: Evap. HC: Refuel HC: Runing HC: Rsting HC:	1992 An: 0XCS LDGV 22.5 0.870 2.85 0.98 1.20 0.00 0.56 0.11	I/M ti-tam. Minin Perio LDGT1 22.5 0.000 n Factor 3.28 1.43 1.29 0.00 0.47 0.09	Region Program Program mum Tempo d 1 RVP LDGT2 22.5 0.000 rs (Gm/M 4.72 1.85 2.17 0.00 0.60 0.10	L: Low L: No L: No L: 59. LDGT 0.00 0.00 0.00 0.00 0.00 0.00 0.00	Ar Oper (F) Ma PC HDGV 22.5 0.000 11.13 3.61 6.42 0.00 0.98 0.13	Altin hbient 1 hating P aximum 1 eriod 2 LDDV 	tude: 1 Temp: Node: RVP: 1 LDDT 22.5 0.000 0.80 0.80	500. Ft. 75.0 / 0.0 / 1. (F) 1.5 Per HDDV 22.5 0.130 2.31 2.31	75.0 / 0.0 / iod 2 1 MC 22.5 0.000 5.68 1.74 3.48 0.46	775.0 F 70.0 7r: 1988 All Veh 2.78 1.16 1.04 0.49 0.10
Cal. Year: 22.5mph 751 Veh. Type: Veh. Spd.: VMT Mix: Composite E Total HC: Exhst HC: Refuel HC: Runing HC: Rsting HC: Exhst CO:	1992 An: 0XCS LDGV 22.5 0.870 2.85 0.98 1.20 0.00 0.56 0.11 13.28	I/M ti-tam. Minin Perio LDGT1 22.5 0.000 n Factor 3.28 1.43 1.29 0.00 0.47 0.09 0.00	Region Program Program mum Temp od 1 RVP LDGT2 22.5 0.000 rs (Gm/M 4.72 1.85 2.17 0.00 0.60 0.10 0.00	L: Low L: No L: No L: 59. LDGT 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00	Ar Oper (F) Ma HDGV 22.5 0.000 11.13 3.61 6.42 0.00 0.98 0.13 0.00	Altii mbient 1 mating P aximum 1 eriod 2 LDDV 	tude: 1 Temp: Node: RVP: 1 LDDT 22.5 0.000 0.80 0.80 0.80	500. Ft. 75.0 / 0.0 / 1. (F) 1.5 Per HDDV 22.5 0.130 2.31 2.31 10.72	75.0 / 0.0 / iod 2 1 MC 22.5 0.000 5.68 1.74 3.48 0.46 0.00	775.0 F 70.0 7r: 1988 All Veh 2.78 1.16 1.04 0.00 0.49 0.10 12.95
Cal. Year: 22.5mph 751 Veh. Type: Veh. Spd.: VMT Mix: Composite E Total HC: Exhst HC: Refuel HC: Runing HC: Rsting HC: Exhst CO: Exhst NOX:	1992 An: 0XCS LDGV 22.5 0.870 cmission 2.85 0.98 1.20 0.06 0.56 0.11 13.28 0.86	I/M ti-tam. Minin Perio LDGT1 22.5 0.000 n Factor 3.28 1.43 1.29 0.00 0.47 0.09 0.00	Region Program Program mum Temp od 1 RVP LDGT2 22.5 0.000 rs (Gm/M 4.72 1.85 2.17 0.00 0.60 0.10 0.00 0.00	ile) ile) ile) ile) ile) ile) ile) 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00	Ar Oper (F) Ma Pr HDGV 22.5 0.000 11.13 3.61 6.42 0.00 0.98 0.13 0.00 0.00	Altii hbient 1 ating P aximum 1 eriod 2 LDDV 22.5 0.000 0.60 0.60 0.60 0.00 0.00	tude: 1 Temp: Node: RVP: 1 LDDT 22.5 0.000 0.80 0.80 0.80 0.00 0.00	500. Ft. 75.0 / 0.0 / 1. (F) 1.5 Per HDDV 22.5 0.130 2.31 2.31 10.72 15.02	75.0 / 0.0 / iod 2 1 MC 22.5 0.000 5.68 1.74 3.48 0.46 0.00 0.00	775.0 F 70.0 7r: 1988 All Veh 2.78 1.16 1.04 0.00 0.49 0.10 12.95 2.70
Cal. Year: 22.5mph 751 Veh. Type: Veh. Spd.: VMT Mix: Composite E Total HC: Exhst HC: Exhst HC: Refuel HC: Runing HC: Rsting HC: Exhst CO: Exhst NOX: Hot Stabili	1992 An: 0XCS LDGV 22.5 0.870 mission 2.85 0.98 1.20 0.00 0.56 0.11 13.28 0.86 zed Idi	I/M ti-tam. Minin Perio LDGT1 22.5 0.000 n Factor 3.28 1.43 1.29 0.00 0.47 0.90 0.47 0.90 0.00	Region Program Program mum Tempod 1 RVP LDGT2 22.5 0.000 rs (Gm/M 4.72 1.85 2.17 0.00 0.60 0.60 0.00 0.00 sion Fac	L Low No No S 59. 11.5 LDGT 0.00 00	Ar Oper (F) Ma Pr HDGV 22.5 0.000 11.13 3.61 6.42 0.00 0.98 0.13 0.00 0.00 Gm/Hr)	Altiin hoient 1 rating P aximum 1 eriod 2 LDDV 22.5 0.000 0.60 0.60 0.60 0.00	tude: femp: fode: Femp: 97 RVP: 1 LDDT 22.5 0.000 0.80 0.80 0.00 0.00	500. Ft. 75.0 / 0.0 / 1. (F) 1.5 Per HDDV 22.5 0.130 2.31 2.31 2.31	75.0 / 0.0 / MC 22.5 0.000 5.68 1.74 3.48 0.46 0.00 0.00	75.0 F 0.0 71: 1988 All Veh 2.78 1.16 1.04 0.00 0.49 0.10 12.95 2.70
Cal. Year: 22.5mph 75 Veh. Type: Veh. Spd.: VMT Mix: Composite E Total HC: Exhst HC: Exhst HC: Refuel HC: Runing HC: Rsting HC: Exhst CO: Exhst NOX: Hot Stabili Idle HC:	1992 An: 0XCS LDGV 22.5 0.870 mission 2.85 0.98 1.20 0.00 0.56 0.11 13.28 0.86 zed Idi 24.27	I/M ti-tam. Minin Perin LDGT1 22.5 0.000 n Factor 3.28 1.43 1.29 0.00 0.47 0.00 0.47 0.09 0.00 0.00 le Emis: 0.00	Region Program Program num Tempod 1 RVP LDGT2 22.5 0.000 rs (Gm/M 4.72 1.85 2.17 0.00 0.60 0.60 0.00 sion Fac 0.00	Low No No No So So LDGT LDGT 0.00	Ar Oper (F) Ma Pr HDGV 22.5 0.000 11.13 3.61 6.42 0.00 0.98 0.13 0.00 0.00 Gm/Hr) 0.00	Altiin hoient 1 rating P eriod 2 LDDV 22.5 0.000 0.60 0.60 0.00 0.00 0.00	tude: femp: fode: Femp: 97 RVP: 1 LDDT 22.5 0.000 0.80 0.80 0.00 0.00 0.00 0.00	500. Ft. 75.0 / 0.0 / 1. (F) 1.5 Pert HDDV 22.5 0.130 2.31 2.31 10.72 15.02 17.37	75.0 / 0.0 / MC 22.5 0.000 5.68 1.74 3.48 0.46 0.00 0.00	75.0 F 0.0 7: 1988 All Veh 2.78 1.16 1.04 0.00 0.49 0.10 12.95 2.70 23.37
Cal. Year: 22.5mph 75 Veh. Type: Veh. Spd.: VMT Mix: Composite E Total HC: Exhst HC: Evap. HC: Refuel HC: Runing HC: Exhst NOX: Hot Stabili Idle HC: Idle CO:2	1992 An: 0XCS LDGV 22.5 0.870 2.85 0.98 1.20 0.00 0.56 0.11 13.28 0.86 ized Idi 24.27 293.10	I/M ti-tam. Minin Perin LDGT1 22.5 0.000 n Factor 3.28 1.43 1.29 0.00 0.47 0.09 0.00 0.00 le Emiss 0.00	Region Program Program hum Temp od 1 RVP LDGT2 22.5 0.000 rs (Gm/M 4.72 1.85 2.17 0.00 0.60 0.00 0.00 0.00	Low Low No No Solution Solution LDGT LDGT LDGT 0.00	Ar Oper (F) Ha Pr HDGV 22.5 0.000 11.13 3.61 6.42 0.00 0.98 0.13 0.00 0.00 Gm/Hr) 0.00	Altii mbient 1 rating P eriod 2 LDDV 22.5 0.000 0.60 0.60 0.00 0.00 0.00 0.00	tude: femp: fode: Femp: 97 RVP: 1 LDDT 22.5 0.000 0.80 0.80 0.00 0.00 0.00 0.00 0.00	500. Ft. 75.0 / 0.0 / 1. (F) 1.5 Per: HDDV 22.5 0.130 2.31 2.31 2.31 10.72 15.02 17.37 51.18	75.0 / 0.0 / MC 22.5 0.000 5.68 1.74 3.48 0.46 0.00 0.00 0.00	75.0 F 0.0 (r: 1988 All Veh 2.78 1.16 1.04 0.00 0.49 0.10 12.95 2.70 23.37 261.65
Cal. Year: 22.5mph 75 Veh. Type: Veh. Spd.: VMT Mix: Composite E Total HC: Exhst HC: Exhst HC: Refuel HC: Runing HC: Rsting HC: Exhst NOX: Hot Stabili Idle HC: Idle NOX:	1992 Ant 0XCS LDGV 22.5 0.870 2.85 0.98 1.20 0.00 0.56 0.11 13.28 0.86 0.24 24.27 24.27 2.93.10 2.90	I/M ti-tam. Minin Perin LDGT1 22.5 0.000 n Factor 3.28 1.43 1.29 0.00 0.47 0.09 0.47 0.09 0.00 0.00 le Emiss 0.00 0.00	Region Program Program Dum Tempod 1 RVP LDGT2 22.5 0.000 rs (Gm/M 4.72 1.85 2.17 0.00 0.60 0.10 0.00 0.00 0.00 0.00	ile) ile) ile) ile) ile) ile) 0.00	Ar Oper (F) Ha PC HDGV 22.5 0.000 11.13 3.61 6.42 0.00 0.98 0.13 0.00 0.00 0.00 0.00 0.00	Altii hbient 1 rating P eriod 2 LDDV 22.5 0.000 0.60 0.60 0.00 0.00 0.00 0.00	tude: femp: femp: 9 RVP: 1 LDDT 22.5 0.000 0.80 0.80 0.00 0.00 0.00 0.00 0.00 0.00	500. Ft. 75.0 / 0.0 / 1. (F) 1.5 Per: HDDV 22.5 0.130 2.31 2.31 2.31 10.72 15.02 17.37 51.18 22.32	75.0 / 0.0 / MC 22.5 0.000 5.68 1.74 3.48 0.46 0.00 0.00 0.00 0.00	75.0 F 0.0 7: 1988 All Veh 2.78 1.16 1.04 0.00 0.49 0.10 12.95 2.70 23.37 261.65 5.43

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Cal.	Year:	1992		Region	: Low		Alti	ude: 5	500. Ft.		
			I/M	Program	: No	An	bient 1	emo:	75.0 /	75.0 /	75.0 F
				Desgram		0		and a s	0.0 /	001	0.0
		Ant	1 - Cam.	Program	: NO	oper	ating	ioue:	0.0 /	0.0 /	0.0
25.Om	ph 751	0%CS									
			Minin	num Temp	: 59.	(F) Ma	aximum 1	femp: 91	. (F)		
			Perio	od 1 RVP	: 11.5	Pe	eriod 2	RVP: 1	1.5 Peri	od 2 Y	r: 1988
Vah	Time.	IDCV	I DOT1	LDCT2	IDCT	HDCV	IDDV	IDDT		NC	All Vob
ven.	Type:	LDGV	LUGIT	LUGIZ	LUGI	nDGV	LUUV	LUUI	NUD V		ALL VEN
Veh.	Spd.:	25.0	25.0	25.0		25.0	25.0	25.0	25.0	25.0	
VMT	Mix:	0.870	0.000	0.000		0.000	0.000	0.000	0.130	0.000	
Compo	site	mission	- Factor	rs (Gm/M	ile)						
Total	щс.	2 71	3 07	4 45	0 00	10 55	0.55	0 74	2 12	5 54	2 43
Totat	nc.	2.71	3.07	4.43	0.00	7 47	0.55	0.74	2.12	1.10	2.05
EXAST	HC:	0.09	1.20	1.05	0.00	3.13	0.55	0.74	2.12	1.02	1.05
Evap.	HC:	1.20	1.29	2.17	0.00	6.42				3.48	1.04
Refue	I HC:	0.00	0.00	0.00	0.00	0.00					0.00
Runin	g HC:	0.51	0.43	0.54	0.00	0.88					0.44
Detin		0 11	0 00	0 10	0 00	0 13				0 46	0 10
Fuhat	ig iic.	44 47	0.07	0.00	0.00	0.00	0.00	0.00	0 50	0.40	11 /0
EXIST	ເບະ	11.0/	0.00	0.00	0.00	0.00	0.00	0.00	9.39	0.00	11.40
Exhst	NOX:	0.84	0.00	0.00	0.00	0.00	0.00	0.00	14.50	0.00	2.61
Hot S	tabil	ized Id	le Emiss	sion Fac	tors (Gm/Hr)					
Idle	HC:	24.27	0.00	0.00	0.00	0.00	0.00	0.00	17.37	0.00	23.37
Idle	CO-1	203 10	0 00	0 00	0 00	0 00	0 00	0 00	51 18	0 00	261 65
Talla	NOV	2 00	0.00	0.00	0.00	0.00	0.00	0.00	27.70	0.00	E /7
Idle	NUX:	2.90	0.00	0.00	0.00	0.00	0.00	0.00	22.32	0.00	5.43
Contraction											
Cal.	Year:	1992		Region	: Low		Alti	tude:	500. Ft.		
Cal.	Year:	1992	I/M	Region Program	: Low	A	Alti	tude: ! Temp:	500. Ft. 75.0 /	75.0 /	75.0 F
Cal.	Year:	1992 Ani	I/M ti-tam.	Region Program Program	: Low : No	A	Alti mbient rating	tude: ! Temp: Node:	500. Ft. 75.0 / 0.0 /	75.0 /	75.0 F
Cal.	Year:	1992 Ani F 0205	I/M ti-tam.	Region Program Program	: Low : No : No	Ai Ope	Alti mbient rating	tude: Temp: Mode:	500. Ft 75.0 / 0.0 /	75.0 / 0.0 /	75.0 F
Cal. 27.5m	Year: nph 75	1992 An F 0%CS	I/M ti-tam.	Region Program Program	: Low : No : No	Ai Oper	Alti mbient rating i	tude: ! Temp: Mode:	500. Ft. 75.0 / 0.0 /	75.0 / 0.0 /	75.0 F 0.0
Cal. 27.5m	Year: nph 75	1992 An F 0%CS	I/M ti-tam. Miniu	Region Program Program mum Temp	:: Low :: No :: No :: 59.	Ai Ope (F) Mi	Alti mbient rating aximum	tude: ! Temp: Mode: Temp: 9	500. Ft. 75.0 / 0.0 / 1. (F)	75.0 / 0.0 /	75.0 F 0.0
Cal. 27.5m	Year: nph 75	1992 An F 0%CS	I/M ti-tam. Minin Perio	Region Program Program mum Temp od 1 RVP	:: Low :: No :: No :: 59. :: 11.5	Ai Ope (F) Mi Pi	Alti mbient rating aximum eriod 2	tude: ! Temp: Mode: Temp: 9 RVP: 1	500. Ft. 75.0 / 0.0 / 1. (F) 1.5 Per	75.0 / 0.0 / iod 2 Y	75.0 F 0.0
Cal. 27.5m Veh.	Year: nph 75 Type:	1992 An F 0%CS LDGV	I/M ti-tam. Minin Perin LDGT1	Region Program Program mum Temp od 1 RVP LDGT2	:: Low :: No :: No :: 59. : 11.5 LDGT	Ar Ope (F) Ma Po HDGV	Alti mbient rating I aximum eriod 2 LDDV	tude: 1 Temp: Mode: Temp: 9 RVP: 1 LDDT	500. Ft. 75.0 / 0.0 / 1. (F) 1.5 Per HDDV	75.0 / 0.0 / iod 2 Y	75.0 F 0.0 7: 1988 All Veh
Cal. 27.5m Veh.	Year: nph 75 Type:	1992 Ant F 0%CS LDGV	I/M ti-tam. Minin Perin LDGT1	Region Program Program mum Temp od 1 RVP LDGT2	: Low : No : No : 59. : 11.5 LDGT	Ar Ope (F) Ma Po HDGV	Alti mbient rating aximum eriod 2 LDDV	tude: 1 Temp: Mode: Temp: 9 RVP: 1 LDDT	500. Ft 75.0 / 0.0 / 1. (F) 1.5 Per HDDV	75.0 / 0.0 / iod 2 Y	75.0 F 0.0 7: 1988 All Veh
Cal. 27.5m Veh. Veh.	Year: nph 75 Type: Spd.:	1992 An: F 0%CS LDGV	I/M ti-tam. Minin Perio LDGT1 27.5	Region Program Program mum Temp od 1 RVP LDGT2	: Low : No : No : 59. : 11.5 LDGT	Ar Ope (F) M HDGV	Alti mbient rating aximum eriod 2 LDDV	tude: Temp: Mode: Temp: 9 RVP: 1 LDDT	500. Ft; 75.0 / 0.0 / 1. (F) 1.5 Per; HDDV	75.0 / 0.0 / iod 2 Y MC	75.0 F 0.0 7: 1988 All Veh
Cal. 27.5m Veh. Veh.	Year: nph 75 Type: Spd.:	1992 An F 0%CS LDGV 27.5 0 870	I/M ti-tam. Minin Perio LDGT1 27.5	Region Program Program mum Temp od 1 RVP LDGT2 27.5	:: Low :: No :: No :: 59. :: 11.5 LDGT	Ai Ope (F) Mi HDGV 27.5	Alti mbient rating aximum eriod 2 LDDV 27.5	tude: 1 Temp: 9 RVP: 1 LDDT	500. Ft 75.0 / 0.0 / 1. (F) 1.5 Per HDDV 27.5 0 130	75.0 / 0.0 / iod 2 Y MC 27.5	75.0 F 0.0 (r: 1988 All Veh
Cal. 27.5m Veh. Veh.	Year: noh 75 Type: Spd.: Mix:	1992 An F 0%CS LDGV 27.5 0.870	I/M ti-tam. Minin Perio LDGT1 27.5 0.000	Region Program Program mum Temp od 1 RVP LDGT2 27.5 0.000	:: Low :: No :: No :: 59. : 11.5 LDGT	Ai Ope (F) Mi Pi HDGV 27.5 0.000	Alti mbient rating aximum eriod 2 LDDV 27.5 0.000	tude: 1 Temp: Mode: Temp: 9 RVP: 1 LDDT 27.5 0.000	500. Ft 75.0 / 0.0 / 1. (F) 1.5 Per HDDV 27.5 0.130	75.0 / 0.0 / iod 2 Y MC 27.5 0.000	75.0 F 0.0 (r: 1988 All Veh
Cal. 27.5m Veh. Veh. VMT Compo	Year: noh 75 Type: Spd.: Mix: site	1992 Ant F 0XCS LDGV 27.5 0.870 Emission	I/M ti-tam. Minin Perin LDGT1 27.5 0.000 n Facto	Region Program Program od 1 RVP LDGT2 27.5 0.000 rs (Gm/M	:: Low :: No :: S9. :: 11.5 LDGT iile)	Ar Oper (F) Mr Pr HDGV 27.5 0.000	Alti mbient rating f aximum eriod 2 LDDV 27.5 0.000	tude: 1 Temp: Mode: Temp: 9 RVP: 1 LDDT 27.5 0.000	500. Ft 75.0 / 0.0 / 1. (F) 1.5 Per HDDV 27.5 0.130	75.0 / 0.0 / iod 2 Y MC 27.5 0.000	75.0 F 0.0 (r: 1988 All Veh
Cal. 27.5m Veh. Veh. VMT Compo	Year: nph 75 Type: Spd.: Mix: usite I HC:	1992 An F 0%CS LDGV 27.5 0.870 Emission 2.58	I/M ti-tam. Minin Perin LDGT1 27.5 0.000 n Facto 2.89	Region Program Program mum Temp od 1 RVP LDGT2 27.5 0.000 rs (Gm/M 4.22	:: Low :: No :: S9. :: 11.5 LDGT ile) 0.00	An Oper (F) Mi HDGV 27.5 0.000 10.08	Alti mbient rating eriod 2 LDDV 27.5 0.000 0.51	tude: 1 Temp: Node: Temp: 9 RVP: 1 LDDT 27.5 0.000 0.68	500. Ft. 75.0 / 0.0 / 1. (F) 1.5 Per- HDDV 27.5 0.130 1.96	75.0 / 0.0 / iod 2 Y MC 27.5 0.000 5.45	75.0 F 0.0 7r: 1988 All Veh 2.50
Cal. 27.5m Veh. Veh. VMT Compo Total Exhst	Year: ph 75 Type: Spd.: Mix: bsite HC: HC:	1992 Ann F 0%CS LDGV 27.5 0.870 Emission 2.58 0.81	I/M ti-tam. Minin Peri LDGT1 27.5 0.000 Facto 2.89 1.12	Region Program Program mum Tempo od 1 RVP LDGT2 27.5 0.000 rs (Gm/M 4.22 1.46	:: Low :: No :: S9. :: 11.5 LDGT iile) 0.00 0.00	Ar Ope (F) Mr HDGV 27.5 0.000 10.08 2.74	Alti mbient rating eriod 2 LDDV 27.5 0.000 0.51 0.51	tude: Temp: Mode: Temp: 9 RVP: 1 LDDT 27.5 0.000 0.68 0.68	500. Ft. 75.0 / 0.0 / 1. (F) 1.5 Per HDDV 27.5 0.130 1.96 1.96	75.0 / 0.0 / iod 2 Y MC 27.5 0.000 5.45 1.51	75.0 F 0.0 (r: 1988 All Veh 2.50 0.96
Cal. 27.5m Veh. Veh. VMT Compo Total Exhst	Year: pph 75 Type: Spd.: Mix: Ssite I HC: HC: HC:	1992 Ann F 0%CS LDGV 27.5 0.870 Emission 2.58 0.81 1.20	I/M ti-tam. Minin Perin LDGT1 27.5 0.000 Facto 2.89 1.12 1.29	Region Program Program mum Temp od 1 RVP LDGT2 27.5 0.000 rs (Gm/M 4.22 1.46 2.17	:: Low :: No :: S9. :: 11.5 LDGT iile) 0.00 0.00 0.00	Ar Ope (F) M. Pr HDGV 27.5 0.000 10.08 2.74 6.42	Alti mbient rating eriod 2 LDDV 27.5 0.000 0.51 0.51	tude: 1 Temp: 4 Mode: Temp: 9 RVP: 1 LDDT 27.5 0.000 0.68 0.68	500. Ft. 75.0 / 0.0 / 1. (F) 1.5 Per HDDV 27.5 0.130 1.96 1.96	75.0 / 0.0 / iod 2 Y MC 27.5 0.000 5.45 1.51 3.48	75.0 F 0.0 7r: 1988 All Veh 2.50 0.96 1.04
Cal. 27.5m Veh. Veh. VMT Compo Total Exhst Evap. Pefus	Year: Type: Spd.: Mix: Site HC: HC: HC: HC:	1992 Ani F 0%CS LDGV 27.5 0.870 Emission 2.58 0.81 1.20 0.00	I/M ti-tam. Minin Perin LDGT1 27.5 0.000 Facto 2.89 1.12 1.29 0.00	Region Program Program mum Temp od 1 RVP LDGT2 27.5 0.000 rs (Gm/M 4.22 1.46 2.17 0.00	:: Low :: No :: S9. :: 11.5 LDGT 0.00 0.00 0.00 0.00	Ai Ope (F) M: P, HDGV 27.5 0.000 10.08 2.74 6.42 0.00	Alti mbient rating eriod 2 LDDV 27.5 0.000 0.51 0.51	tude: 1 Temp: 4 Mode: Temp: 9 RVP: 1 LDDT 27.5 0.000 0.68 0.68	500. Ft. 75.0 / 0.0 / 1. (F) 1.5 Per HDDV 27.5 0.130 1.96 1.96	75.0 / 0.0 / iod 2 Y MC 27.5 0.000 5.45 1.51 3.48	75.0 F 0.0 7r: 1988 All Veh 2.50 0.96 1.04 0.00
Cal. 27.5m Veh. Veh. VMT Compo Total Exhst Exhst	Year: ph 75 Type: Spd.: Mix: HC: HC: HC: HC: HC:	1992 Ann F 0%CS LDGV 27.5 0.870 Emission 2.58 0.81 1.20 0.00	I/M ti-tam. Minin Perin LDGT1 27.5 0.000 Facto 2.89 1.12 1.29 0.00	Region Program Program mum Temp od 1 RVP LDGT2 27.5 0.000 rs (Gm/M 4.22 1.46 2.17 0.00	: Low : No : S9. : 11.5 LDGT ile) 0.00 0.00 0.00 0.00	Ar Ope (F) Mr HDGV 27.5 0.000 10.08 2.74 6.42 0.00	Alti mbient rating eriod 2 LDDV 27.5 0.000 0.51 0.51	tude: 1 Temp: 4 Mode: Temp: 9 RVP: 1 LDDT 27.5 0.000 0.68 0.68	500. Ft. 75.0 / 0.0 / 1. (F) 1.5 Per- HDDV 27.5 0.130 1.96 1.96	75.0 / 0.0 / iod 2 Y MC 27.5 0.000 5.45 1.51 3.48	75.0 F 0.0 7r: 1988 All Veh 2.50 0.96 1.04 0.00
Cal. 27.5m Veh. Veh. VMT Compo Total Exhst Evap. Refue Runin	Year: poh 75 Type: Spd.: Mix: HC: HC: HC: HC: HC: HC: HC: HC	1992 Ann F 0%CS LDGV 27.5 0.870 Emission 2.58 0.81 1.20 0.00 0.46	I/M ti-tam. Minin Perin LDGT1 27.5 0.000 Facto 2.89 1.12 1.29 0.00 0.39	Region Program Program mum Temp od 1 RVP LDGT2 27.5 0.000 rs (Gm/M 4.22 1.46 2.17 0.00 0.49	: Low : No : No : 59. : 11.5 LDGT 	Ar Ope (F) Mr HDGV 27.5 0.000 10.08 2.74 6.42 0.00 0.80	Alti mbient rating eriod 2 LDDV 27.5 0.000 0.51 0.51	tude: 1 Temp: 4 Mode: Temp: 9 RVP: 1 LDDT 27.5 0.000 0.68 0.68	500. Ft. 75.0 / 0.0 / 1. (F) 1.5 Per- HDDV 27.5 0.130 1.96 1.96	75.0 / 0.0 / MC 27.5 0.000 5.45 1.51 3.48	75.0 F 0.0 7r: 1988 All Veh 2.50 0.96 1.04 0.00 0.40
Cal. 27.5m Veh. Veh. VMT Compo Total Exhst Evap. Refue Runin Rstin	Year: poh 75 Type: Spd.: Mix: Ssite I HC: HC: HC: HC: IG HC: IG HC:	1992 Ann F 0%CS LDGV 27.5 0.870 2.58 0.81 1.20 0.00 0.46 0.11	I/M ti-tam. Minin Peri LDGT1 27.5 0.000 Facto 2.89 1.12 1.29 0.00 0.39 0.09	Region Program Program mum Temp od 1 RVP LDGT2 27.5 0.000 rs (Gm/M 4.22 1.46 2.17 0.00 0.49 0.10	: Low : No : No : 59. : 11.5 LDGT 0.00 0.00 0.00 0.00 0.00 0.00	Ar Ope (F) Mr HDGV 27.5 0.000 10.08 2.74 6.42 0.00 0.80 0.13	Alti mbient rating eriod 2 LDDV 27.5 0.000 0.51 0.51	tude: 1 Temp: Mode: Temp: 9 RVP: 1 LDDT 27.5 0.000 0.68 0.68	500. Ft. 75.0 / 0.0 / 1. (F) 1.5 Per HDDV 27.5 0.130 1.96 1.96	75.0 / 0.0 / iod 2 Y MC 27.5 0.000 5.45 1.51 3.48 0.46	75.0 F 0.0 7r: 1988 All Veh 2.50 0.96 1.04 0.00 0.40 0.10
Cal. 27.5m Veh. Veh. VMT Compo Total Exhst Evap. Refue Runin Rstin Exhst	Year: Type: Spd.: Mix: Ssite HC: HC: HC: HC: Sg HC: Sg HC: CO:	1992 Ant F 0%CS LDGV 27.5 0.870 Emission 2.58 0.81 1.20 0.00 0.46 0.11 10.33	I/M ti-tam. Minin Perin LDGT1 27.5 0.000 Facto 2.89 1.12 1.29 0.00 0.39 0.09 0.00	Region Program Program mum Temp cod 1 RVP LDGT2 27.5 0.000 rs (Gm/M 4.22 1.46 2.17 0.00 0.49 0.10 0.00	: Low : No : No : 59. : 11.5 LDGT 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00	Ar Ope (F) Mr HDGV 27.5 0.000 10.08 2.74 6.42 0.00 0.80 0.13 0.00	Alti mbient rating eriod 2 LDDV 27.5 0.000 0.51 0.51 0.51	tude: 1 Temp: 4 Node: Temp: 9 RVP: 1 LDDT 27.5 0.000 0.68 0.68 0.68	500. Ft: 75.0 / 0.0 / 1. (F) 1.5 Per HDDV 27.5 0.130 1.96 1.96 8.67	75.0 / 0.0 / iod 2 Y MC 27.5 0.000 5.45 1.51 3.48 0.46 0.00	75.0 F 0.0 7: 1988 All Veh 2.50 0.96 1.04 0.00 0.40 0.10 10.11
Cal. 27.5m Veh. Veh. VMT Compo Total Exhst Evap. Refue Runin Exhst Exhst	Year: Type: Spd.: Mix: Site HC: HC: HC: NG: CO: NOX:	1992 Ann F 0%CS LDGV 27.5 0.870 Emission 2.58 0.81 1.20 0.00 0.46 0.11 10.33 0.82	I/M ti-tam. Minin Perin LDGT1 27.5 0.000 Facto 2.89 1.12 1.29 0.00 0.39 0.39 0.00 0.00	Region Program Program mum Temp od 1 RVP LDGT2 27.5 0.000 rs (Gm/M 4.22 1.46 2.17 0.00 0.49 0.10 0.00 0.00	: Low : No : No : 59. : 11.5 LDGT 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00	Ai Ope: (F) Mi P/ HDGV 27.5 0.000 10.08 2.74 6.42 0.00 0.80 0.13 0.00 0.00	Alti mbient rating eriod 2 LDDV 27.5 0.000 0.51 0.51 0.51 0.00 0.00	tude: Temp: Mode: Temp: 9 RVP: 1 LDDT 27.5 0.000 0.68 0.68 0.68 0.00	500. Ft. 75.0 / 0.0 / 1. (F) 1.5 Per- HDDV 27.5 0.130 1.96 1.96 8.67 14.11	75.0 / 0.0 / iod 2 Y MC 27.5 0.000 5.45 1.51 3.48 0.46 0.00 0.00	75.0 F 0.0 7r: 1988 All Veh 2.50 0.96 1.04 0.40 0.40 0.10 10.11 2.54
Cal. 27.5m Veh. Veh. VMT Compo Total Exhst Evap. Refue Runin Rstin Exhst Exhst	Year: Type: Spd.: Mix: HC: HC: HC: HC: GHC: Sg HC: Sg HC: NOX: Type: NOX: Type: NOX: Type: NOX: Type: NOX: Type: NOX: Type: NOX: Type: NOX: Type: NOX: Type: Type: Type: NOX: Type: Type: Type: NOX: Type: Type: Type: NOX: Type: T	1992 Ann F 0%CS LDGV 27.5 0.870 Emission 2.58 0.81 1.20 0.00 0.46 0.11 10.33 0.82 ized Id	I/M ti-tam. Minin Perin LDGT1 27.5 0.000 Facto 2.89 1.12 1.29 0.00 0.39 0.09 0.09 0.00 0.00	Region Program Program mum Temp od 1 RVP LDGT2 27.5 0.000 rs (Gm/M 4.22 1.46 2.17 0.00 0.49 0.10 0.00 0.00 sion Fac	: Low : No : No : 59. : 11.5 LDGT 	Ai Ope (F) Mi HDGV 27.5 0.000 10.08 2.74 6.42 0.00 0.80 0.13 0.00 0.00 0.00 0.00 0.00	Alti mbient rating f eriod 2 LDDV 27.5 0.000 0.51 0.51 0.51	tude: Temp: Mode: Temp: 9 RVP: 1 LDDT 27.5 0.000 0.68 0.68 0.68	500. Ft. 75.0 / 0.0 / 1. (F) 1.5 Per- HDDV 27.5 0.130 1.96 1.96 1.96 8.67 14.11	75.0 / 0.0 / MC 27.5 0.000 5.45 1.51 3.48 0.46 0.00 0.00	75.0 F 0.0 7r: 1988 All Veh 2.50 0.96 1.04 0.00 0.40 0.10 10.11 2.54
Cal. 27.5m Veh. Veh. VMT Compo Total Exhst Exhst Refue Runin Rstin Exhst Hot S	Year: Type: Spd.: Mix: HC: HC: HC: HC: HC: HC: HC: HC	1992 Ann F 0%CS LDGV 27.5 0.870 2.58 0.81 1.20 0.00 0.46 0.11 10.33 0.82 ized Id 26 27	I/M ti-tam. Minin Peri LDGT1 27.5 0.000 Facto 2.89 1.12 1.29 0.00 0.39 0.09 0.00 0.00 le Emisi	Region Program Program mum Temp od 1 RVP LDGT2 27.5 0.000 rs (Gm/M 4.22 1.46 2.17 0.00 0.49 0.10 0.00 0.00 sion Fac	: Low : No : No : 59. : 11.5 LDGT 	Ai Ope (F) Mi HDGV 27.5 0.000 10.08 2.74 6.42 0.00 0.80 0.13 0.00 0.00 Gm/Hr)	Alti mbient rating f eriod 2 LDDV 27.5 0.000 0.51 0.51 0.00 0.00	tude: 1 Temp: 4 Node: Temp: 9 RVP: 1 LDDT 27.5 0.000 0.68 0.68 0.68	500. Ft. 75.0 / 0.0 / 1. (F) 1.5 Per HDDV 27.5 0.130 1.96 1.96 1.96 8.67 14.11	75.0 / 0.0 / MC 27.5 0.000 5.45 1.51 3.48 0.46 0.00 0.00	75.0 F 0.0 7r: 1988 All Veh 2.50 0.96 1.04 0.00 0.40 0.10 10.11 2.54 23.37
Cal. 27.5m Veh. Veh. VMT Compo Total Exhst Exhst Exhst Hot S Idle	Year: Type: Spd.: Mix: Ssite HC: HC: Sg HC: Sg	1992 Ann F 0%CS LDGV 27.5 0.870 2.58 0.81 1.20 0.00 0.46 0.11 10.33 0.82 ized Id 24.27	I/M ti-tam. Minin Peri LDGT1 27.5 0.000 Facto 2.89 1.12 1.29 0.00 0.39 0.09 0.00 0.00 le Emis: 0.00	Region Program Program mum Temp od 1 RVP LDGT2 27.5 0.000 rs (Gm/M 4.22 1.46 2.17 0.00 0.49 0.10 0.00 0.00 sion Fac 0.00	: Low : No : No : 59. : 11.5 LDGT	Ai Ope (F) Mi HDGV 27.5 0.000 10.08 2.74 6.42 0.00 0.80 0.13 0.00 0.00 Gm/Hr) 0.00	Alti mbient rating eriod 2 LDDV 27.5 0.000 0.51 0.51 0.51 0.00 0.00 0.00	tude: 1 Temp: 4 Mode: Temp: 9 RVP: 1 LDDT 27.5 0.000 0.68 0.68 0.68 0.68	500. Ft. 75.0 / 0.0 / 1. (F) 1.5 Per- HDDV 27.5 0.130 1.96 1.96 1.96 8.67 14.11 17.37	75.0 / 0.0 / iod 2 Y MC 27.5 0.000 5.45 1.51 3.48 0.46 0.00 0.00	75.0 F 0.0 7r: 1988 All Veh 2.50 0.96 1.04 0.00 0.40 0.40 0.10 10.11 2.54 23.37
Cal. 27.5m Veh. Veh. VMT Compo Total Exhst Evap. Refue Runin Rstin Exhst Hot S Idle Idle	Year: Type: Spd.: Mix: site HC: HC: HC: UHC: Sg HC: NOX: tabil HC: CO:	1992 Ann F 0%CS LDGV 27.5 0.870 Emission 2.58 0.81 1.20 0.06 0.46 0.11 10.33 0.82 ized Id 24.27 293.10	I/M ti-tam. Minin Perin LDGT1 27.5 0.000 n Facto 2.89 1.12 1.29 0.00 0.39 0.09 0.00 0.00 0.00 Le Emis: 0.00 0.00	Region Program Program mum Temp od 1 RVP LDGT2 27.5 0.000 rs (Gm/M 4.22 1.46 2.17 0.00 0.49 0.10 0.00 0.00 sion Fac 0.00 0.00	: Low : No : No : 59. : 11.5 LDGT 0.00 0.	Ai Ope: (F) Mi HDGV 27.5 0.000 10.08 2.74 6.42 0.00 0.80 0.13 0.00 0.00 Gm/Hr) 0.00 0.00	Alti mbient rating f aximum eriod 2 LDDV 27.5 0.000 0.51 0.51 0.51 0.00 0.00 0.00 0	tude: 1 Temp: 4 Mode: Temp: 9 RVP: 1 LDDT 27.5 0.000 0.68 0.68 0.68 0.68	500. Ft. 75.0 / 0.0 / 1. (F) 1.5 Per- HDDV 27.5 0.130 1.96 1.96 1.96 1.96 1.96	75.0 / 0.0 / iod 2 Y MC 27.5 0.000 5.45 1.51 3.48 0.46 0.00 0.00 0.00	75.0 F 0.0 7r: 1988 All Veh 2.50 0.96 1.04 0.00 0.40 0.10 10.11 2.54 23.37 261.65
Cal. 27.5m Veh. Veh. VMT Compo Total Exhst Evap. Refue Runin Rstin Exhst Exhst Idle Idle	Year: ph 75 Type: Spd.: Mix: Site HC: HC: HC: CO: NOX: NOX:	1992 Ann F 0%CS LDGV 27.5 0.870 Emission 2.58 0.81 1.20 0.00 0.46 0.11 10.33 0.82 ized Id 24.27 293.10 2.90	I/M ti-tam. Minin Perin LDGT1 27.5 0.000 5 Facto 2.89 1.12 1.29 0.00 0.39 0.00 0.09 0.00 0.00 le Emis: 0.00 0.00 0.00	Region Program Program mum Temp od 1 RVP LDGT2 27.5 0.000 rs (Gm/M 4.22 1.46 2.17 0.00 0.49 0.10 0.00 0.00 sion Fac 0.00 0.00 0.00	: Low : No : No : 59. : 11.5 LDGT . 100 0.000 0.00	Ai Ope: (F) Mi P(HDGV 27.5 0.000 10.08 2.74 6.42 0.00 0.80 0.80 0.30 0.00 Gm/Hr) 0.00 0.00 0.00	Alti mbient rating f eriod 2 LDDV 27.5 0.000 0.51 0.51 0.51 0.00 0.00 0.00 0	tude: Temp: Mode: Temp: 9 RVP: 1 LDDT 27.5 0.000 0.68 0.68 0.68 0.00 0.00 0.00 0.0	500. Ft. 75.0 / 0.0 / 1. (F) 1.5 Per- HDDV 27.5 0.130 1.96 1.96 1.96 8.67 14.11 17.37 51.18 22.32	75.0 / 0.0 / iod 2 Y MC 27.5 0.000 5.45 1.51 3.48 0.46 0.00 0.00 0.00 0.00	75.0 F 0.0 7r: 1988 All Veh 2.50 0.96 1.04 0.00 0.40 0.10 10.11 2.54 23.37 261.65 5.43

Cal. Year:					the second s	a second data and the second data and the				CONTRACTOR OF THE OWNER.
	1992		Region	: Low		Alti	tude: !	500. Ft.		
		1/M	Program	: No	Ar	nbient 1	iemp:	75.0 /	75.0 /	75.0 F
	An	ti-tam.	Program	: No	Oper	rating)	lode:	0.0/	0.0 /	0.0
30.0mph 75	F 0%CS									
		Mini	num Temp	: 59.	(F) Ma	aximum 1	femp: 9	1. (F)		
		Perio	od 1 RVP	: 11.5	Pe	eriod 2	RVP: 1	1.5 Peri	iod 2 Y	'r: 1988
Veh. Type:	LDGV	LDGT1	LDGT2	LDGT	HDGV	LDDV	LDDT	HDDV	MC	All Veh
			-					-	-	
Veh. Spd.:	30.0	30.0	30.0		30.0	30.0	30.0	30.0	30.0	
VMT Mix:	0.870	0.000	0.000		0.000	0.000	0.000	0.130	0.000	
Composite	Emissio	n Facto	rs (Gm/M	ile)		10. L_1				
Total HC:	2.47	2.74	4.03	0.00	9.70	0.47	0.63	1.82	5.36	2.39
Exhst HC:	0.75	1.00	1.31	0.00	2.42	0.47	0.63	1.82	1.42	0.89
Evap. HC:	1.20	1.29	2.17	0.00	6.42				3.48	1.04
Refuel HC:	0.00	0.00	0.00	0.00	0.00	-				0.00
Runing HC:	0.42	0.35	0.45	0.00	0.73					0.36
Rsting HC:	0.11	0.09	0.10	0.00	0.13				0.46	0.10
Exhst CO:	9.20	0.00	0.00	0.00	0.00	0.00	0.00	7.93	0.00	9.04
Exhst NOX:	0.80	0.00	0.00	0.00	0.00	0.00	0.00	13.86	0.00	2.50
Hot Stabil	ized Id	le Emis	sion Fac	tors (Gm/Hr)					
Idle HC:	24.27	0.00	0.00	0.00	0.00	0.00	0.00	17.37	0.00	23.37
Idle CO:	293.10	0.00	0.00	0.00	0.00	0.00	0.00	51.18	0.00	261.65
Idle NOX:	2.90	0.00	0.00	0.00	0.00	0.00	0.00	22.32	0.00	5.43
Cal. Year:	1992		Region	: Low		Altii	tude: !	500. Ft.		
Cal. Year:	1992	I/M	Region Program	: Low : No	Ал	Altin mbient 1	tude: ! femp:	500. Ft. 75.0 /	75.0 /	75.0 F
Cal. Year:	1992 Ani	l/M ti-tam.	Region Program Program	: Low : No : No	An Oper	Altin mbient 1 rating P	tude: ! Temp: tode:	500. Ft. 75.0 / 0.0 /	75.0 / 0.0 /	75.0 F
Cal. Year: 32.5mph 75	1992 Ani F 0%CS	I/M ti-tam.	Region Program Program	: Low : No : No	An Oper	Altin mbient 1 rating P	tude: ! femp: fode:	500. Ft. 75.0 / 0.0 /	75.0 / 0.0 /	75.0 F
Cal. Year: 32.5mph 75	1992 Ani F 0%CS	I/M ti-tam. Minin	Region Program Program mum Temp	: Low : No : No : 59.	An Oper (F) Ma	Altin mbient 1 rating P aximum 1	tude: ! Temp: Node: Temp: 9'	500. Ft. 75.0 / 0.0 /	75.0 / 0.0 /	75.0 F 0.0
Cal. Year: 32.5mph 75	1992 Ant F 0%CS	I/M ti-tam. Minin Perio	Region Program Program mum Temp od 1 RVP	: Low : No : No : 59. : 11.5	An Oper (F) Ma Pe	Altin mbient 1 rating P aximum 1 eriod 2	tude: 5 Temp: fode: Temp: 9 RVP: 1	500. Ft. 75.0 / 0.0 / 1. (F) 1.5 Peri	75.0 / 0.0 /	75.0 F 0.0
Cal. Year: 32.5mph 75 Veh. Type:	1992 Ant F 0%CS LDGV	I/M ti-tam. Minin Perio LDGT1	Region Program Program mum Temp od 1 RVP LDGT2	: Low : No : No : 59. : 11.5 LDGT	An Oper (F) Ma Pe HDGV	Altin mbient 1 rating P aximum 1 eriod 2 LDDV	tude: 5 femp: fode: femp: 9 RVP: 1 LDDT	500. Ft. 75.0 / 0.0 / 1. (F) 1.5 Peri HDDV	75.0 / 0.0 / iod 2 Y	75.0 F 0.0 7: 1988 All Veh
Cal. Year: 32.5mph 75 Veh. Type:	1992 Ant F 0%CS LDGV	I/M ti-tam. Minin Perin LDGT1	Region Program Program mum Temp od 1 RVP LDGT2	: Low : No : No : 59. : 11.5 LDGT	An Oper (F) Ma Pe HDGV	Altin mbient 1 rating P aximum 1 eriod 2 LDDV	tude: ! femp: fode: femp: 9' RVP: 1' LDDT	500. Ft. 75.0 / 0.0 / 1. (F) 1.5 Peri HDDV	75.0 / 0.0 / od 2 Y	75.0 F 0.0 7: 1988 All Veh
Cal. Year: 32.5mph 75 Veh. Type: Veh. Spd.:	1992 Ant F 0%CS LDGV 32.5	I/M ti-tam. Minin Perio LDGT1 32.5	Region Program Program mum Temp od 1 RVP LDGT2 32.5	: Low : No : No : 59. : 11.5 LDGT	An Oper (F) Ma Pe HDGV	Altin mbient 1 rating P aximum 1 eriod 2 LDDV 32.5	femp: femp: fode: femp: 9' RVP: 1' LDDT 32.5	500. Ft. 75.0 / 0.0 / 1. (F) 1.5 Peri HDDV 32.5	75.0 / 0.0 / iod 2 Y MC 32.5	75.0 F 0.0 7: 1988 All Veh
Cal. Year: 32.5mph 75 Veh. Type: Veh. Spd.: VMT Mix:	1992 Ant F 0%CS LDGV 32.5 0.870	I/M ti-tam. Minin Perio LDGT1 32.5 0.000	Region Program Program num Temp od 1 RVP LDGT2 32.5 0.000	: Low : No : No : 59. : 11.5 LDGT	An Oper (F) Ma HDGV 32.5 0.000	Altin mbient 1 rating P aximum 1 eriod 2 LDDV 32.5 0.000	tude: 5 femp: fode: femp: 9 RVP: 1 LDDT 32.5 0.000	500. Ft. 75.0 / 0.0 / 1. (F) 1.5 Peri HDDV 32.5 0.130	75.0 / 0.0 / od 2 Y MC 32.5 0.000	75.0 F 0.0 7: 1988 All Veh
Cal. Year: 32.5mph 75 Veh. Type: Veh. Spd.: VMT Mix: Composite	1992 Ant F 0%CS LDGV 32.5 0.870 Emission	I/M ti-tam. Minin Perio LDGT1 32.5 0.000 n Factor	Region Program Program mum Temp od 1 RVP LDGT2 32.5 0.000 rs (Gm/M	: Low : No : S9. : 11.5 LDGT ile)	An Oper (F) Ma Po HDGV 32.5 0.000	Altin mbient 1 rating M aximum 1 eriod 2 LDDV 32.5 0.000	tude: 5 femp: fode: femp: 9 RVP: 1 LDDT 32.5 0.000	500. Ft. 75.0 / 0.0 / 1. (F) 1.5 Peri HDDV 32.5 0.130	75.0 / 0.0 / iod 2 Y MC 32.5 0.000	75.0 F 0.0 7: 1988 All Veh
Cal. Year: 32.5mph 75 Veh. Type: Veh. Spd.: VMT Mix: Composite Total HC:	1992 Ant F 0%CS LDGV 32.5 0.870 Emission 2.38	I/M ti-tam. Minin Perio LDGT1 32.5 0.000 Factor 2.61	Region Program Program num Temp od 1 RVP LDGT2 32.5 0.000 rs (Gm/M 3.86	: Low : No : S9. : 11.5 LDGT ile) 0.00	An Oper (F) Ma Po HDGV 32.5 0.000 9.38	Altin nbient 1 rating P aximum 1 eriod 2 LDDV 32.5 0.000 0.44	tude: ! femp: femp: 9 RVP: 1 LDDT 32.5 0.000 0.59	500. Ft. 75.0 / 0.0 / 1. (F) 1.5 Peri HDDV 32.5 0.130 1.70	75.0 / 0.0 / od 2 Y MC 32.5 0.000 5.27	75.0 F 0.0 7: 1988 All Veh
Cal. Year: 32.5mph 75 Veh. Type: Veh. Spd.: VHT Mix: Composite I Total HC: Exhst HC:	1992 Ant F 0%CS LDGV 32.5 0.870 Emission 2.38 0.69	I/M ti-tam. Minin Perio LDGT1 32.5 0.000 Factor 2.61 0.90	Region Program Program mum Tempod 1 RVP LDGT2 	: Low : No : S9. : 11.5 LDGT ile) 0.00 0.00	An Oper (F) Ma Pe HDGV 32.5 0.000 9.38 2.16	Altin mbient 1 rating P aximum 1 eriod 2 LDDV 32.5 0.000 0.44 0.44	tude: 9 femp: 9 fode: femp: 9 RVP: 1 LDDT 32.5 0.000 0.59 0.59	500. Ft. 75.0 / 0.0 / 1. (F) 1.5 Peri HDDV 32.5 0.130 1.70 1.70	75.0 / 0.0 / od 2 Y MC 32.5 0.000 5.27 1.33	75.0 F 0.0 7r: 1988 All Veh 2.29 0.82
Cal. Year: 32.5mph 75 Veh. Type: Veh. Spd.: VMT Mix: Composite I Total HC: Exhst HC: Evap. HC:	1992 Ant F 0XCS LDGV 32.5 0.870 Emission 2.38 0.69 1.20	I/M ti-tam. Minin Perin LDGT1 32.5 0.000 n Factor 2.61 0.90 1.29	Region Program Program mum Temp od 1 RVP LDGT2 32.5 0.000 rs (Gm/M 3.86 1.18 2.17	: Low : No : S9. : 11.5 LDGT ile) 0.00 0.00 0.00	An Oper (F) Ma Pe HDGV 32.5 0.000 9.38 2.16 6.42	Altin mbient 1 rating P aximum 1 eriod 2 LDDV 32.5 0.000 0.44 0.44	tude: 9 femp: 9 RVP: 1 LDDT 32.5 0.000 0.59 0.59	500. Ft. 75.0 / 0.0 / 1. (F) 1.5 Peri HDDV 32.5 0.130 1.70 1.70	75.0 / 0.0 / ocd 2 Y MC 32.5 0.000 5.27 1.33 3.48	75.0 F 0.0 (r: 1988 All Veh 2.29 0.82 1.04
Cal. Year: 32.5mph 75 Veh. Type: Veh. Spd.: VMT Mix: Composite Total HC: Exhst HC: Evap. HC: Refuel HC:	1992 Ant F 0%CS LDGV 32.5 0.870 Emission 2.38 0.69 1.20 0.00	I/M ti-tam. Minin Perin LDGT1 32.5 0.000 Factor 2.61 0.90 1.29 0.00	Region Program Program mum Temp od 1 RVP LDGT2 	: Low : No : S9. : 11.5 LDGT ile) 0.00 0.00 0.00 0.00	An Oper (F) Ma Pe HDGV 32.5 0.000 9.38 2.16 6.42 0.00	Altin mbient 1 rating P aximum 1 eriod 2 LDDV 32.5 0.000 0.44 0.44	tude: 9 femp: 9 RVP: 1 LDDT 32.5 0.000 0.59 0.59	500. Ft. 75.0 / 0.0 / 1. (F) 1.5 Peri HDDV 32.5 0.130 1.70 1.70	75.0 / 0.0 / od 2 Y MC 32.5 0.000 5.27 1.33 3.48	75.0 F 0.0 7r: 1988 All Veh 2.29 0.82 1.04 0.00
Cal. Year: 32.5mph 75 Veh. Type: Veh. Spd.: VMT Mix: Composite 1 Total HC: Exhst HC: Evap. HC: Refuel HC: Runing HC:	1992 Ant F 0%CS LDGV 32.5 0.870 Emission 2.38 0.69 1.20 0.00 0.38	I/M ti-tam. Minin Perin LDGT1 32.5 0.000 n Factor 2.61 0.90 1.29 0.00 0.32	Region Program Program num Temp od 1 RVP LDGT2 	: Low : No : S9. : 11.5 LDGT ile) 0.00 0.00 0.00 0.00 0.00	An Oper (F) Ma Pe HDGV 32.5 0.000 9.38 2.16 6.42 0.00 0.67	Altin mbient 1 rating P aximum 1 ariod 2 LDDV 32.5 0.000 0.44 0.44	tude: 9 femp: 9 RVP: 1 LDDT 32.5 0.000 0.59 0.59	500. Ft. 75.0 / 0.0 / 1. (F) 1.5 Peri HDDV 32.5 0.130 1.70 1.70	75.0 / 0.0 / od 2 Y MC 32.5 0.000 5.27 1.33 3.48	75.0 F 0.0 7: 1988 All Veh 2.29 0.82 1.04 0.00 0.33
Cal. Year: 32.5mph 75 Veh. Type: Veh. Spd.: VMT Mix: Composite 1 Total HC: Exhst HC: Evap. HC: Refuel HC: Runing HC: Rsting HC:	1992 Antr F 0%CS LDGV 32.5 0.870 Emission 2.38 0.69 1.20 0.00 0.38 0.11	I/M ti-tam. Minin Perio LDGT1 32.5 0.000 Factor 2.61 0.90 1.29 0.00 0.32 0.09	Region Program Program mum Temp od 1 RVP LDGT2 32.5 0.000 rs (Gm/M 3.86 1.18 2.17 0.00 0.41 0.10	: Low : No : S9. : 11.5 LDGT 0.00 0.00 0.00 0.00 0.00 0.00 0.00	An Oper (F) Ma Pe HDGV 32.5 0.000 9.38 2.16 6.42 0.00 0.67 0.13	Altin mbient 1 rating P ariod 2 LDDV 32.5 0.000 0.44 0.44	tude: 9 femp: 9 RVP: 1 LDDT 32.5 0.000 0.59 0.59	500. Ft. 75.0 / 0.0 / 1. (F) 1.5 Peri HDDV 32.5 0.130 1.70 1.70	75.0 / 0.0 / od 2 Y MC 32.5 0.000 5.27 1.33 3.48 0.46	75.0 F 0.0 7r: 1988 All Veh 2.29 0.82 1.04 0.00 0.33 0.10
Cal. Year: 32.5mph 75 Veh. Type: Veh. Spd.: VMT Mix: Composite I Total HC: Exhst HC: Evap. HC: Refuel HC: Runing HC: Exhst CO:	1992 Ant F 0%CS LDGV 32.5 0.870 Emission 2.38 0.69 1.20 0.00 0.38 0.11 8.24	I/M ti-tam. Minin Perio LDGT1 32.5 0.000 Factor 2.61 0.90 1.29 0.00 0.32 0.09 0.00	Region Program Program num Temp od 1 RVP LDGT2 32.5 0.000 rs (Gm/M 3.86 1.18 2.17 0.00 0.41 0.10 0.00	: Low : No : S9. : 11.5 LDGT ile) 0.00 0.00 0.00 0.00 0.00 0.00 0.00	An Oper (F) Ma Pe HDGV 32.5 0.000 9.38 2.16 6.42 0.00 0.67 0.13 0.00	Altin mbient 1 rating P aximum 1 eriod 2 LDDV 32.5 0.000 0.44 0.44 0.44	tude: 9 femp: 9 RVP: 1 LDDT 32.5 0.000 0.59 0.59 0.00	500. Ft. 75.0 / 0.0 / 1. (F) 1.5 Peri HDDV 32.5 0.130 1.70 1.70 7.34	75.0 / 0.0 / od 2 Y MC 32.5 0.000 5.27 1.33 3.48 0.46 0.00	75.0 F 0.0 r: 1988 All Veh 2.29 0.82 1.04 0.03 0.10 8.12
Cal. Year: 32.5mph 75 Veh. Type: Veh. Spd.: VMT Mix: Composite I Total HC: Exhst HC: Evap. HC: Refuel HC: Runing HC: Exhst CO: Exhst NOX:	1992 Ant F 0%CS LDGV 32.5 0.870 Emission 2.38 0.69 1.20 0.00 0.38 0.11 8.24 0.79	I/M ti-tam. Minin Perio LDGT1 32.5 0.000 n Factor 2.61 0.90 1.29 0.00 0.32 0.09 0.00 0.00	Region Program Program num Temp od 1 RVP LDGT2 32.5 0.000 rs (Gm/M 3.86 1.18 2.17 0.00 0.41 0.10 0.41 0.10 0.00 0.00	: Low : No : S9. : 11.5 LDGT ile) 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00	An Oper (F) Ma Pe HDGV 32.5 0.000 9.38 2.16 6.42 0.00 0.67 0.13 0.00 0.00	Altin mbient 1 rating P aximum 1 eriod 2 LDDV 32.5 0.000 0.44 0.44 0.44	tude: 9 femp: 9 RVP: 1 LDDT 32.5 0.000 0.59 0.59 0.00 0.00	500. Ft. 75.0 / 0.0 / 1. (F) 1.5 Peri HDDV 32.5 0.130 1.70 1.70 1.70 7.34 13.74	75.0 / 0.0 / ocd 2 Y MC 32.5 0.000 5.27 1.33 3.48 0.46 0.00 0.00	75.0 F 0.0 7: 1988 All Veh 2.29 0.82 1.04 0.03 0.10 8.12 2.47
Cal. Year: 32.5mph 75 Veh. Type: Veh. Spd.: VMT Mix: Composite I Total HC: Exhst HC: Evap. HC: Refuel HC: Refuel HC: Rsting HC: Exhst CO: Exhst CO: Exhst NOX: Hot Stabil	1992 Ant F 0%CS LDGV 32.5 0.870 2.38 0.69 1.20 0.00 0.38 0.11 8.24 0.79 ized Idl	I/M ti-tam. Minin Perio LDGT1 32.5 0.000 n Factor 2.61 0.90 1.29 0.00 0.32 0.09 0.00 0.00 0.00 0.00	Region Program Program mum Tempod 1 RVP LDGT2 32.5 0.000 rs (Gm/M 3.86 1.18 2.17 0.00 0.41 0.10 0.00 0.00 0.00 sion Fac	: Low : No : S9. : 11.5 LDGT ile) 0.00 0.	An Oper (F) Ma Pe HDGV 32.5 0.000 9.38 2.16 6.42 0.00 0.67 0.13 0.00 0.00 0.00 Gm/Hr)	Altin mbient 1 rating P aximum 1 ariod 2 LDDV 32.5 0.000 0.44 0.44 0.44	tude: 9 femp: fode: femp: 97 RVP: 17 LDDT 32.5 0.000 0.59 0.59 0.00 0.00	500. Ft. 75.0 / 0.0 / 1. (F) 1.5 Peri HDDV 32.5 0.130 1.70 1.70 1.70 7.34 13.74	75.0 / 0.0 / od 2 Y MC 32.5 0.000 5.27 1.33 3.48 0.46 0.00 0.00	75.0 F 0.0 7: 1988 All Veh 2.29 0.82 1.04 0.03 0.10 8.12 2.47
Cal. Year: 32.5mph 75 Veh. Type: Veh. Spd.: VMT Mix: Composite I Total HC: Exhst HC: Evap. HC: Refuel HC: Rsting HC: Exhst CO: Exhst CO: Exhst NOX: Hot Stabil Idle HC:	1992 Anti F 0%CS LDGV 32.5 0.870 2.38 0.69 1.20 0.08 0.69 1.20 0.38 0.11 8.24 0.79 ized Idl 24.27	I/M ti-tam. Minin Perio LDGT1 32.5 0.000 n Factor 2.61 0.90 1.29 0.00 0.32 0.09 0.00 0.00 0.00 0.00 0.00	Region Program Program mum Tempod 1 RVP LDGT2 32.5 0.000 rs (Gm/M 3.86 1.18 2.17 0.00 0.41 0.10 0.00 0.00 sion Fac 0.00	: Low : No : S9. : 11.5 LDGT ile) 0.00	An Oper (F) Ma Pe HDGV 32.5 0.000 9.38 2.16 6.42 0.00 0.67 0.13 0.00 0.00 Gm/Hr) 0.00	Altin mbient 1 rating P aximum 1 eriod 2 LDDV 32.5 0.000 0.44 0.44 0.44 0.00 0.00 0.00	tude: 9 femp: fode: femp: 97 RVP: 17 LDDT 32.5 0.000 0.59 0.59 0.00 0.00 0.00	500. Ft. 75.0 / 0.0 / 1. (F) 1.5 Peri HDDV 32.5 0.130 1.70 1.70 1.70 1.70 1.70	75.0 / 0.0 / od 2 Y MC 32.5 0.000 5.27 1.33 3.48 0.46 0.00 0.00	75.0 F 0.0 7: 1988 All Veh 2.29 0.82 1.04 0.00 0.33 0.10 8.12 2.47 23.37
Cal. Year: 32.5mph 75 Veh. Type: Veh. Spd.: VMT Mix: Composite I Total HC: Exhst HC: Evap. HC: Refuel HC: Runing HC: Exhst CO: Exhst NOX: Hot Stabil Idle HC: Idle CO:	1992 Anti F 0XCS LDGV 32.5 0.870 2.38 0.69 1.20 0.00 0.38 0.11 8.27 jized Idi 24.27 293.10	I/M ti-tam. Minin Perio LDGT1 32.5 0.000 n Factor 2.61 0.90 1.29 0.00 0.32 0.09 0.00 0.00 0.00 0.00 le Emiss 0.00 0.00	Region Program Program mum Tempod 1 RVP LDGT2 32.5 0.000 rs (Gm/M 3.86 1.18 2.17 0.00 0.41 0.10 0.00 0.00 sion Fac 0.000 0.00	: Low : No : No : 59. : 11.5 LDGT ile) 0.00 0.	An Oper (F) Ma Pe HDGV 32.5 0.000 9.38 2.16 6.42 0.00 0.67 0.13 0.00 0.00 Gm/Hr) 0.00 0.00	Altin mbient 1 rating P aximum 1 eriod 2 LDDV 32.5 0.000 0.44 0.44 0.44 0.00 0.00 0.00 0	tude: 9 femp: fode: femp: 97 RVP: 17 LDDT 32.5 0.000 0.59 0.59 0.00 0.00 0.00 0.00	500. Ft. 75.0 / 0.0 / 1. (F) 1.5 Peri HDDV 32.5 0.130 1.70 1.70 1.70 1.70 1.70 1.70 1.70 1.7	75.0 / 0.0 / od 2 Y MC 32.5 0.000 5.27 1.33 3.48 0.46 0.00 0.00 0.00	75.0 F 0.0 7: 1988 All Veh 2.29 0.82 1.04 0.00 0.33 0.10 2.47 23.37 261.65
Cal. Year: 32.5mph 75 Veh. Type: Veh. Spd.: VMT Mix: Composite I Total HC: Exhst HC: Evap. HC: Refuel HC: Runing HC: Exhst NOX: Hot Stabil Idle HC: Idle Co: Idle NOX:	1992 Ant F 0XCS LDGV 32.5 0.870 2.38 0.69 1.20 0.00 0.38 0.11 8.24 0.01 8.27 9 ized Idl 24.27 293.10 2.90	I/M ti-tam. Minin Perio LDGT1 32.5 0.000 Factor 2.61 0.90 1.29 0.00 0.32 0.09 0.00 0.00 0.00 0.00 0.00	Region Program Program mum Tempod 1 RVP LDGT2 32.5 0.000 rs (Gm/M 3.86 1.18 2.17 0.00 0.41 0.10 0.00 0.00 0.00 0.00 0.00	: Low : No : No : 59. : 11.5 LDGT ile) 0.00 0.00 0.00 0.00 0.00 0.00 tors (0.00	An Oper (F) Ma Pe HDGV 32.5 0.000 9.38 2.16 6.42 0.00 0.67 0.13 0.00 0.00 Gm/Hr) 0.00 0.00 0.00	Altin mbient 1 rating P aximum 1 eriod 2 LDDV 32.5 0.000 0.44 0.44 0.44 0.00 0.00 0.00 0	Lude: 9 Temp: 4 Aode: Temp: 9 RVP: 1 ¹ LDDT 32.5 0.000 0.59 0.59 0.00 0.00 0.00 0.00 0.00 0.00 0.00	500. Ft. 75.0 / 0.0 / 1. (F) 1.5 Peri HDDV 32.5 0.130 1.70 1.70 1.70 1.70 1.70 1.70 1.70 1.7	75.0 / 0.0 / od 2 Y MC 32.5 0.000 5.27 1.33 3.48 0.46 0.00 0.00 0.00 0.00	75.0 F 0.0 7: 1988 All Veh 2.29 0.82 1.04 0.00 0.33 0.10 8.12 2.47 23.37 261.65 5.43

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Cal.	Year:	1992		Region	: Low		Alti	tude: 5	600. Ft.		
			1/M	Program	: No	Ar	nbient 1	iemp:	75.0 /	75.0 /	75.0 F
		Ant	i-tam.	Program	No.	Oper	ating)	tode:	0.0 /	0.0 /	0.0
35 0	mh 758	0205									
55.00		0.000	Minie		. 50	(E) M	vimm		(E)		
			Deni	non i pvp	. 11 5		aniad 2	DVD • 11	5 Deci	~ 2 V	1088
	-		Perio					L DDT			ALL Val
ven.	Type:	LDGV	LUGII	LUGIZ	LUGI	HUGV	LDUV	LUUT	HUUV	mu.	All ven
				75.0		75.0	75.0	75.0	75.0	75 0	
Ven.	Spd.:	35.0	35.0	35.0		35.0	35.0	35.0	35.0	35.0	
VM	Mix:	0.870	0.000	0.000		0.000	0.000	0.000	0.130	0.000	
Compo	osite l	mission	n Facto	rs (Gm/M	ile)						
Tota	HC:	2.30	2.50	3.72	0.00	9.11	0.41	0.55	1.60	5.20	2.20
Exhs	HC:	0.64	0.82	1.07	0.00	1.95	0.41	0.55	1.60	1.26	0.77
Evap	. HC:	1.20	1.29	2.17	0.00	6.42				3.48	1.04
Refu	el HC:	0.00	0.00	0.00	0.00	0.00					0.00
Runir	ng HC:	0.35	0.30	0.38	0.00	0.62					0.30
Rstin	ng HC:	0.11	0.09	0.10	0.00	0.13				0.46	0.10
Exhst	t CO:	7.42	0.00	0.00	0.00	0.00	0.00	0.00	6.87	0.00	7.35
Exhs	NOX:	0.78	0.00	0.00	0.00	0.00	0.00	0.00	13.74	0.00	2.46
Hot :	Stabil	ized Id	le Emis	sion Fac	tors (Gm/Hr)					
Idle	HC:	24.27	0.00	0.00	0.00	0.00	0,00	0.00	17.37	0,00	23.37
Idle	- CO:2	293.10	0.00	0.00	0.00	0.00	0.00	0.00	51.18	0.00	261.65
Idl	NOX	2.90	0.00	0.00	0.00	0.00	0 00	0 00	22.32	0 00	5 43
	L HOAT	2.70	0.00	0.00	0.00	0.00	0.00	0.00		0.00	2.45
Cal	Year	1002		Penion	1 04		Alti	tude:	500 Et		
Cal.	Year:	1992	1 /14	Region	: Low		Alti	tude:	500. Ft.		7505
Cal.	Year:	1992	1/M	Region Program	: Low : No	Ai	Alti	tude: ! Temp:	500. Ft. 75.0 /	75.0 /	75.0 F
Cal.	Year:	1992 Ani	I/M ti-tam.	Region Program Program	: Low : No : No	Ai Ope	Alti mbient rating	tude: Temp: Mode:	500. Ft. 75.0 / 0.0 /	75.0 / 0.0 /	75.0 F
Cal.	Year: mph 75	1992 Ani F 0%CS	I/M ti-tam.	Region Program Program	: Low : No : No	Ar Ope	Alti mbient rating	tude: ! Temp: Mode:	500. Ft. 75.0 / 0.0 /	75.0 / 0.0 /	75.0 F 0.0
Cal.	Year: mph 75	1992 Ant F 0%CS	I/M ti-tam. Miniu	Region Program Program	: Low : No : No : 59.	Ai Ope (F) M	Alti mbient rating aximum	tude: Temp: Mode: Temp: 9	500. Ft. 75.0 / 0.0 / 1. (F)	75.0 /	75.0 F
Cal.	Year: mph 75	1992 An F 0%CS	I/M ti-tam. Minin Perin	Region Program Program mum Temp od 1 RVP	: Low : No : No : 59. : 11.5	Ai Ope (F) Mi P	Alti mbient rating aximum eriod 2	tude: Temp: Mode: Temp: 9 RVP: 1	500. Ft. 75.0 / 0.0 / 1. (F) 1.5 Peri	75.0 / 0.0 /	75.0 F 0.0
Cal. 37.5 Veh.	Year: mph 75 Type:	1992 An F 0%CS LDGV	I/M ti-tam. Minin Perin LDGT1	Region Program Program mum Temp od 1 RVP LDGT2	: Low : No : No : 59. : 11.5 LDGT	Ai Ope (F) Mi Pi HDGV	Alti mbient rating aximum eriod 2 LDDV	tude: Temp: Mode: Temp: 9 RVP: 1 LDDT	500. Ft. 75.0 / 0.0 / 1. (F) 1.5 Peri HDDV	75.0 / 0.0 / iod 2 1 MC	75.0 F 0.0 7: 1988 All Veh
Cal. 37.5 Veh.	Year: mph 75 Type:	1992 Ani F 0%CS LDGV	I/M ti-tam. Minif Perif LDGT1	Region Program Program mum Temp od 1 RVP LDGT2	: Low : No : No : 59. : 11.5 LDGT	Ar Ope (F) Mi Pr HDGV	Alti mbient rating aximum eriod 2 LDDV	tude: Temp: Mode: Temp: 9 RVP: 1 LDDT	500. Ft. 75.0 / 0.0 / 1. (F) 1.5 Per HDDV	75.0 / 0.0 / iod 2 1 MC	75.0 F 0.0 7: 1988 All Veh
Cal. 37.5 Veh. Veh.	Year: mph 75 Type: Spd.:	1992 An: F 0%CS LDGV 37.5	I/M ti-tam. Minin Perin LDGT1 37.5	Region Program Program mum Temp od 1 RVP LDGT2 37.5	: Low : No : No : 59. : 11.5 LDGT	Ai Ope (F) Hi HDGV 37.5	Alti mbient rating aximum eriod 2 LDDV 37.5	tude: Temp: Mode: Temp: 9' RVP: 1 LDDT 37.5	500. Ft. 75.0 / 0.0 / 1. (F) 1.5 Per HDDV 37.5	75.0 / 0.0 / iod 2 1 MC 37.5	75.0 F 0.0 7r: 1988 All Veh
Cal. 37.5 Veh. Veh.	Year: mph 75 Type: Spd.: [Mix:	1992 An: F 0%CS LDGV 37.5 0.870	I/M ti-tam. Minid Perid LDGT1 37.5 0.000	Region Program Program mum Temp od 1 RVP LDGT2 	: Low : No : No : 59. : 11.5 LDGT	Ai Ope (F) Mi HDGV 37.5 0.000	Alti mbient rating aximum eriod 2 LDDV 37.5 0.000	tude: 5 Temp: 9 RVP: 1 LDDT 37.5 0.000	500. Ft. 75.0 / 0.0 / 1. (F) 1.5 Per HDDV 37.5 0.130	75.0 / 0.0 / iod 2 1 MC 37.5 0.000	75.0 F 0.0 7: 1988 All Veh
Cal. 37.5 Veh. Veh. VH Comp	Year: mph 75 Type: Spd.: I Mix: psite I	1992 Ani F 0%CS LDGV 37.5 0.870 Emission	I/M ti-tam. Minid Perid LDGT1 37.5 0.000 n Factor	Region Program Program mum Temp od 1 RVP LDGT2 	: Low : No : No : 59. : 11.5 LDGT ile)	Ai Ope (F) Mi HDGV 37.5 0.000	Alti mbient rating eximum eriod 2 LDDV 37.5 0.000	tude: 5 Temp: 9 RVP: 1 LDDT 37.5 0.000	500. Ft. 75.0 / 0.0 / 1. (F) 1.5 Peri HDDV 37.5 0.130	75.0 / 0.0 / iod 2 1 MC 37.5 0.000	75.0 F 0.0 7: 1988 All Veh
Cal. 37.5/ Veh. Veh. VM Compo	Year: mph 75 Type: Spd.: I Mix: psite I L HC:	1992 Ani F 0%CS LDGV 37.5 0.870 Emission 2.22	I/M ti-tam. Perio LDGT1 37.5 0.000 n Factor 2.40	Region Program Program mum Temp od 1 RVP LDGT2 37.5 0.000 rs (Gm/M 3.60	: Low : No : S9. : 11.5 LDGT ile) 0.00	Ai Ope (F) Mi HDGV 37.5 0.000 8.90	Alti mbient rating aximum eriod 2 LDDV 37.5 0.000 0.39	tude: 1 Temp: Mode: Temp: 9 RVP: 1 LDDT 37.5 0.000 0.52	500. Ft. 75.0 / 0.0 / 1. (F) 1.5 Peri HDDV 37.5 0.130 1.51	75.0 / 0.0 / iod 2 1 MC 37.5 0.000 5.14	75.0 F 0.0 7r: 1988 All Veh 2.13
Cal. 37.5 Veh. Veh. Vm Compo Tota Exhs	Year: mph 75 Type: Spd.: f Mix: osite L L HC: t HC:	1992 An: F 0%CS LDGV 37.5 0.870 2.22 0.60	I/M ti-tam. Minin Perin LDGT1 37.5 0.000 n Facto 2.40 0.74	Region Program Program mum Temp od 1 RVP LDGT2 37.5 0.000 rs (Gm/H 3.60 0.97	: Low : No : S9. : 11.5 LDGT ile) 0.00 0.00	Ar Ope (F) M. Pr HDGV 37.5 0.000 8.90 1.78	Alti mbient rating aximum eriod 2 LDDV 37.5 0.000 0.39 0.39	tude: 1 Temp: Mode: Temp: 9 RVP: 1 LDDT 37.5 0.000 0.52 0.52	500. Ft. 75.0 / 0.0 / 1. (F) 1.5 Per HDDV 37.5 0.130 1.51 1.51	75.0 / 0.0 / iod 2 1 MC 37.5 0.000 5.14 1.20	75.0 F 0.0 7r: 1988 All Veh 2.13 0.72
Cal. 37.5 Veh. Veh. Vm Compo Tota Exhs Evap	Year: mph 75 Type: Spd.: f Mix: osite I L HC: t HC: . HC:	1992 Ann F 0%CS LDGV 37.5 0.870 Emission 2.22 0.60 1.20	I/M ti-tam. Minin Perin LDGT1 37.5 0.000 n Facto 2.40 0.74 1.29	Region Program Program mum Temp od 1 RVP LDGT2 37.5 0.000 rs (Gm/M 3.60 0.97 2.17	: Low : No : S9. : 11.5 LDGT ile) 0.00 0.00 0.00	Ar Ope (F) M. P, HDGV 37.5 0.000 8.90 1.78 6.42	Alti mbient rating aximum eriod 2 LDDV 37.5 0.000 0.39 0.39	tude: 1 Temp: Mode: Temp: 9 RVP: 1 LDDT 37.5 0.000 0.52 0.52	500. Ft. 75.0 / 0.0 / 1. (F) 1.5 Per HDDV 37.5 0.130 1.51 1.51	75.0 / 0.0 / iod 2 1 MC 37.5 0.000 5.14 1.20 3.48	775.0 F 7 0.0 7r: 1988 All Veh 2.13 0.72 1.04
Cal. 37.5 Veh. Veh. Vm Compo Tota Exhs Evap Refue	Year: mph 75 Type: Spd.: Mix: psite H L HC: L HC: eL HC:	1992 Ann F 0%CS LDGV 37.5 0.870 Emission 2.22 0.60 1.20 0.00	I/M ti-tam. Minin Perin LDGT1 37.5 0.000 n Facto 2.40 0.74 1.29 0.00	Region Program Program mum Temp od 1 RVP LDGT2 37.5 0.000 rs (Gm/M 3.60 0.97 2.17 0.00	: Low : No : S9. : 11.5 LDGT ile) 0.00 0.00 0.00 0.00	Ai Ope (F) M. HDGV 37.5 0.000 8.90 1.78 6.42 0.00	Alti mbient rating aximum eriod 2 LDDV 37.5 0.000 0.39 0.39	tude: 1 Temp: Mode: Temp: 9 RVP: 1 LDDT 37.5 0.000 0.52 0.52	500. Ft. 75.0 / 0.0 / 1. (F) 1.5 Per HDDV 37.5 0.130 1.51 1.51	75.0 / 0.0 / iod 2 1 MC 37.5 0.000 5.14 1.20 3.48	75.0 F 70.0 71: 1988 All Veh 2.13 0.72 1.04 0.00
Cal. 37.5 Veh. Veh. Vm Compo Tota Exhs Evap Refue Runii	Year: mph 75 Type: Spd.: T Mix: psite H L HC: t HC: t HC: ng HC:	1992 Ann F 0%CS LDGV 37.5 0.870 Emission 2.22 0.60 1.20 0.00 0.31	I/M ti-tam. Minin Perin LDGT1 37.5 0.000 n Factor 2.40 0.74 1.29 0.00 0.28	Region Program Program mum Temp od 1 RVP LDGT2 37.5 0.000 rs (Gm/M 3.60 0.97 2.17 0.00 0.35	: Low : No : S9. : 11.5 LDGT ile) 0.00 0.00 0.00 0.00 0.00	Ai Ope (F) M. P. HDGV 37.5 0.000 8.90 1.78 6.42 0.00 0.57	Alti mbient rating eriod 2 LDDV 37.5 0.000 0.39 0.39	tude: 1 Temp: Mode: Temp: 9 RVP: 1 LDDT 37.5 0.000 0.52 0.52	500. Ft. 75.0 / 0.0 / 1. (F) 1.5 Peri HDDV 37.5 0.130 1.51 1.51	75.0 / 0.0 / iod 2 1 MC 37.5 0.000 5.14 1.20 3.48	75.0 F 0.0 7: 1988 All Veh 2.13 0.72 1.04 0.00 0.27
Cal. 37.5 Veh. Veh. Veh. VM Compo Tota Exhs Evap Refui Runii Ratii	Year: mph 75 Type: Spd.: T Mix: osite U L HC: t HC: t HC: eL HC: ng HC: ng HC:	1992 Ann F 0%CS LDGV 37.5 0.870 Emission 2.22 0.60 1.20 0.00 0.31 0.11	I/M ti-tam. Minin Perin LDGT1 37.5 0.000 n Facto 2.40 0.74 1.29 0.00 0.28 0.02	Region Program Program mum Temp od 1 RVP LDGT2 37.5 0.000 rs (Gm/M 3.60 0.97 2.17 0.00 0.35 0.10	: Low : No : S9. : 11.5 LDGT ile) 0.00 0.00 0.00 0.00 0.00	Al Ope (F) M. P HDGV 37.5 0.000 8.90 1.78 6.42 0.00 0.57 0.13	Alti mbient rating aximum eriod 2 LDDV 37.5 0.000 0.39 0.39	tude: 1 Temp: Mode: Temp: 9 RVP: 1 LDDT 37.5 0.000 0.52 0.52	500. Ft. 75.0 / 0.0 / 1. (F) 1.5 Per HDDV 37.5 0.130 1.51 1.51	75.0 / 0.0 / iod 2 1 MC 37.5 0.000 5.14 1.20 3.48	775.0 F 70.0 7r: 1988 All Veh 2.13 0.72 1.04 0.00 0.27 0.10
Cal. 37.5 Veh. Veh. Vm Compo Tota Exhs Evap Refue Refue Runit Exhs	Year: mph 75 Type: Spd.: f Mix: osite I L HC: t HC: t HC: eL HC: ng HC: mg HC: t CO:	1992 Ann F 0%CS LDGV 37.5 0.870 Emission 2.22 0.60 1.20 0.00 0.31 0.11 6.73	I/M ti-tam. Minin Perin LDGT1 37.5 0.000 n Factor 2.40 0.74 1.29 0.00 0.28 0.09 0.00	Region Program Program mum Temp od 1 RVP LDGT2 37.5 0.000 rs (Gm/M 3.60 0.97 2.17 0.00 0.35 0.10 0.00	: Low : No : S9. : 11.5 LDGT 0.00 0.00 0.00 0.00 0.00 0.00 0.00	Ai Ope (F) Mi P HDGV 37.5 0.000 8.90 1.78 6.42 0.00 0.57 0.13 0.00	Alti mbient rating aximum eriod 2 LDDV 37.5 0.000 0.39 0.39	tude: 1 Temp: Mode: Temp: 9 RVP: 1 LDDT 37.5 0.000 0.52 0.52	500. Ft. 75.0 / 0.0 / 1. (F) 1.5 Pert HDDV 37.5 0.130 1.51 1.51	75.0 / 0.0 / iod 2 1 MC 37.5 0.000 5.14 1.20 3.48 0.46	75.0 F 0.0 7r: 1988 All Veh 2.13 0.72 1.04 0.00 0.27 0.10 6.70
Cal. 37.5/ Veh. Veh. VM Compo Tota Exhs Evap Refu Runii Rstii Exhs	Year: Type: Spd.: T Mix: Dsite H HC: HC: HC: HC: HC: NG HC: T MC: T MC: HC: HC: HC: HC: HC: HC: HC: H	1992 Ann F 0%CS LDGV 37.5 0.870 2.22 0.60 1.20 0.00 0.31 0.11 6.73 0.77	I/M ti-tam. Minin Perin LDGT1 37.5 0.000 n Factor 2.40 0.74 1.29 0.00 0.28 0.09 0.00 0.09	Region Program Program mum Temp od 1 RVP LDGT2 37.5 0.000 rs (Gm/M 3.60 0.97 2.17 0.00 0.35 0.10 0.00	: Low : No : S9. : 11.5 LDGT ile) 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.	Ai Ope (F) Mi HDGV 37.5 0.000 8.90 1.78 6.42 0.00 0.57 0.13 0.00	Alti mbient rating aximum eriod 2 LDDV 37.5 0.000 0.39 0.39 0.39	tude: 1 Temp: Mode: Temp: 9 RVP: 1 LDDT 37.5 0.000 0.52 0.52	500. Ft. 75.0 / 0.0 / 1. (F) 1.5 Pert HDDV 37.5 0.130 1.51 1.51 6.50	75.0 / 0.0 / MC 37.5 0.000 5.14 1.20 3.48 0.46 0.00	75.0 F 70.0 7r: 1988 All Veh 2.13 0.72 1.04 0.00 0.27 0.10 6.70 2.47
Cal. 37.5/ Veh. Veh. VM Tota Exhs: Evap Refu Runii Rstii Exhs: Exhs:	Year: Type: Spd.: T Mix: bsite H HC: HC: HC: HC: NG HC: ng HC: ng HC: t NOX: Stabi	1992 Ann F 0%CS LDGV 37.5 0.870 2.22 0.60 1.20 0.00 0.31 0.11 6.73 0.77	I/M ti-tam. Minin Perin LDGT1 37.5 0.000 n Facto 2.40 0.74 1.29 0.00 0.28 0.09 0.00 0.00	Region Program Program mum Temp od 1 RVP LDGT2 37.5 0.000 rs (Gm/H 3.60 0.97 2.17 0.00 0.35 0.10 0.00 0.00	: Low : No : No : 59. : 11.5 LDGT 0.00 0.00 0.00 0.00 0.00 0.00 0.00	Ai Ope (F) Mi HDGV 37.5 0.000 8.90 1.78 6.42 0.00 0.57 0.13 0.00 0.00 0.00	Alti mbient rating eximum eriod 2 LDDV 37.5 0.000 0.39 0.39 0.39 0.00 0.00	tude: 1 Temp: Mode: Temp: 9 RVP: 1 LDDT 37.5 0.000 0.52 0.52 0.52	500. Ft. 75.0 / 0.0 / 1. (F) 1.5 Per HDDV 37.5 0.130 1.51 1.51 6.50 13.86	75.0 / 0.0 / iod 2 1 MC 37.5 0.000 5.14 1.20 3.48 0.46 0.00 0.00	75.0 F 70.0 7r: 1988 All Veh 2.13 0.72 1.04 0.00 0.27 0.10 6.70 2.47
Cal. 37.5 Veh. Veh. VM Comp Tota Exhs Evap Refu Runii Rstii Exhs Exhs	Year: Type: Spd.: TMix: TMix: TM	1992 An: F 0%CS LDGV 37.5 0.870 2.22 0.60 1.20 0.00 0.31 0.11 6.73 0.77 ized Id 22 22	I/M ti-tam. Minin Perin LDGT1 37.5 0.000 n Facto 2.40 0.74 1.29 0.00 0.28 0.09 0.00 0.00 le Emiss	Region Program Program mum Temp od 1 RVP LDGT2 37.5 0.000 rs (Gm/M 3.60 0.97 2.17 0.00 0.35 0.10 0.00 0.00 sion Fac	: Low : No : No : 59. : 11.5 LDGT ile) 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.	Ari Ope (F) M. HDGV 37.5 0.000 8.90 1.78 6.42 0.00 0.57 0.13 0.00 0.00 Gm/Hr)	Alti mbient rating eriod 2 LDDV 37.5 0.000 0.39 0.39 0.39 0.00 0.00	tude: 1 Temp: Mode: Temp: 9 RVP: 1 LDDT 37.5 0.000 0.52 0.52 0.52	500. Ft. 75.0 / 0.0 / 1. (F) 1.5 Per HDDV 37.5 0.130 1.51 1.51 6.50 13.86	75.0 / 0.0 / iod 2 1 MC 37.5 0.000 5.14 1.20 3.48 0.46 0.00 0.00	75.0 F 70.0 7r: 1988 All Veh 2.13 0.72 1.04 0.00 0.27 0.10 6.70 2.47
Cal. 37.5 Veh. Veh. VM Compute Tota Exhs: Evap Refur R	Year: Type: Spd.: Spd.: Mix: bsite H HC: HC: HC: HC: HC: NG HC: T CO: t NOX: Stabil e HC: C CO: C	1992 Ann F 0%CS LDGV 37.5 0.870 2.22 0.60 1.20 0.00 0.31 0.11 6.73 0.77 ized Id 24.27	I/M ti-tam. Minin Perin LDGT1 37.5 0.000 n Facto 2.40 0.74 1.29 0.00 0.28 0.09 0.00 0.00 le Emis: 0.00	Region Program Program mum Temp od 1 RVP LDGT2 37.5 0.000 rs (Gm/H 3.60 0.97 2.17 0.00 0.35 0.10 0.00 0.00 sion Fac 0.00	: Low : No : No : 59. : 11.5 LDGT ile) 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.	Ari Ope (F) M. HDGV 37.5 0.000 8.90 1.78 6.42 0.00 0.57 0.13 0.00 0.00 Gm/Hr) 0.00	Alti mbient rating 1 eximum eriod 2 LDDV 37.5 0.000 0.39 0.39 0.39 0.39 0.00 0.00	tude: 1 Temp: Mode: Temp: 9 RVP: 1 LDDT 37.5 0.000 0.52 0.52 0.52 0.00 0.00 0.00	500. Ft. 75.0 / 0.0 / 1. (F) 1.5 Per HDDV 37.5 0.130 1.51 1.51 1.51 6.50 13.86 17.37	75.0 / 0.0 / iod 2 Y MC 37.5 0.000 5.14 1.20 3.48 0.46 0.00 0.00	75.0 F 0.0 7r: 1988 All Veh 2.13 0.72 1.04 0.00 0.27 0.10 6.70 2.47 23.37
Cal. 37.5 Veh. Veh. VM Compo Tota Exhs Evap Refur Refur Rstin Exhs Exhs Idlu	Year: mph 75 Type: Spd.: T Mix: psite I HC: HC: HC: NG HC: NOX: Stabil e HC: e CO:	1992 Ann F 0%CS LDGV 37.5 0.870 2.22 0.60 1.20 0.00 0.31 0.11 6.73 0.77 ized Id 24.27 293.10	I/M ti-tam. Minin Perin LDGT1 37.5 0.000 n Facto 2.40 0.74 1.29 0.00 0.28 0.09 0.00 0.00 le Emis: 0.00 0.00	Region Program Program mum Temp od 1 RVP LDGT2 37.5 0.000 rs (Gm/M 3.60 0.97 2.17 0.00 0.35 0.10 0.00 0.00 sion Fac 0.00 0.00	: Low : No : No : 59. : 11.5 LDGT ile) 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.	Ari Ope (F) M. HDGV 37.5 0.000 8.90 1.78 6.42 0.00 0.57 0.13 0.00 0.00 Gm/Hr) 0.00 0.00	Alti mbient rating f aximum eriod 2 LDDV 37.5 0.000 0.39 0.39 0.39 0.39 0.00 0.00 0.0	tude: 1 Temp: Mode: Temp: 9 RVP: 1 LDDT 37.5 0.000 0.52 0.52 0.52 0.00 0.00 0.00 0	500. Ft. 75.0 / 0.0 / 1. (F) 1.5 Per HDDV 37.5 0.130 1.51 1.51 1.51 1.51 1.51 1.51 1.51	75.0 / 0.0 / iod 2 Y MC 37.5 0.000 5.14 1.20 3.48 0.46 0.00 0.00 0.00	775.0 F 0.0 7r: 1988 All Veh 2.13 0.72 1.04 0.00 0.27 0.10 6.70 2.47 23.37 261.65
Cal. 37.50 Veh. Veh. VM Tota Exhs Evapu Refui Runii Runii Runii Runii Idla Idla Idla	Year: mph 75 Type: Spd.: T Mix: osite I L HC: t HC: t HC: ng HC: ng HC: t NOX: Stabil e HC: e NOX:	1992 Ann F 0%CS J7.5 0.870 Emission 2.22 0.60 1.20 0.00 0.31 0.11 6.73 0.77 ized Id 24.27 293.10 2.90	I/M ti-tam. Minin Perin LDGT1 37.5 0.000 n Facto 2.40 0.74 1.29 0.00 0.28 0.09 0.00 0.00 0.00 0.00 0.00 0.00 0.0	Region Program Program mum Temp od 1 RVP LDGT2 37.5 0.000 rs (Gm/M 3.60 0.97 2.17 0.00 0.35 0.10 0.00 0.00 sion Fac 0.00 0.00 0.00	: Low : No : No : 59. : 11.5 LDGT 0.00 0.	Ari Ope (F) M. HDGV 37.5 0.000 8.90 1.78 6.42 0.00 0.57 0.13 0.00 0.00 Gm/Hr) 0.00 0.00 0.00	Alti mbient rating eriod 2 LDDV 37.5 0.000 0.39 0.39 0.39 0.39 0.00 0.00 0.0	tude: 1 Temp: Mode: Temp: 9 RVP: 1 LDDT 37.5 0.000 0.52 0.52 0.52 0.00 0.00 0.00 0	500. Ft. 75.0 / 0.0 / 1. (F) 1.5 Per HDDV 37.5 0.130 1.51 1.51 1.51 1.51 1.51 1.51 1.51 1.5	75.0 / 0.0 / iod 2 1 MC 37.5 0.000 5.14 1.20 3.48 0.46 0.00 0.00 0.00 0.00	775.0 F 0.0 7r: 1988 All Veh 2.13 0.72 1.04 0.00 0.27 0.10 6.70 2.47 23.37 261.65 5.43

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Cal. Y	еаг:	1992		Region	: Low		Altit	ude: 5	500. Ft.		
			I/M	Program	: No	An	nbient 1	iemp:	75.0 /	75.0 /	75.0 F
		Ant	ti-tam.	Program	: No	Oper	rating H	lode:	0.0 /	0.0 /	0.0
40.0mp	h 758	• 0%CS									
			Mini	num Temp	: 59.	(F) Ma	aximum 1	emp: 9	1. (F)		
			Perio	od 1 RVP	: 11.5	Pe	eriod 2	RVP: 1	1.5 Peri	od 2 Y	r: 1988
Veh. T	ype:	LDGV	LDGT1	LDGT2	LDGT	HDGV	LDDV	LDDT	HDDV	MC	All Veh
Veh. S	pd.:	40.0	40.0	40.0		40.0	40.0	40.0	40.0	40.0	
VMT	Mix:	0.870	0.000	0.000		0.000	0.000	0.000	0.130	0.000	
Compos	ite E	mission	n Facto	rs (Gm/M	ile)						
Total	HC:	2.16	2.32	3.49	0.00	8.71	0.37	0.50	1.43	5.09	2.06
Exhst	HC:	0.57	0.68	0.89	0.00	1.64	0.37	0.50	1.43	1.15	0.68
Evap.	HC:	1.20	1.29	2.17	0.00	6.42				3.48	1.04
Refuel	HC:	0.00	0.00	0.00	0.00	0.00					0.00
Runing	HC:	0.28	0.25	0.33	0.00	0.53					0.25
Rsting	HC:	0.11	0.09	0.10	0.00	0.13				0.46	0.10
Exhst	CO:	6.13	0.00	0.00	0.00	0.00	0.00	0.00	6.22	0.00	6.14
Exhst	NOX:	0.77	0.00	0.00	0.00	0.00	0.00	0.00	14.10	0.00	2.50
Hot St	abili	ized Id	le Emis	sion Fac	tors (Gm/Hr)					
Idle	HC:	24.27	0.00	0.00	0.00	0.00	0.00	0.00	17.37	0.00	23.37
Idle	CO:2	293.10	0.00	0.00	0.00	0.00	0.00	0.00	51.18	0.00	261.65
Idle	NOX :	2.90	0.00	0.00	0.00	0.00	0.00	0.00	22.32	0.00	5.43
				- -							
Cal. Y	ear:	1992		Region	: Low		Alti	tude:	500. Ft.	,	
Cal. Y	ear:	1992	1/M	Region Program	: Low	Ar	Altii mbient 1	tude: ! [emp:	500. Ft. 75.0 /	75.0 /	75.0 F
Cal. Y	ear:	1992 An	I/M ti-tam.	Region Program Program	: Low : No : No	Ar Oper	Altin mbient 1 rating N	tude: ! femp: fode:	500. Ft. 75.0 / 0.0 /	/ 75.0 / 0.0	75.0 F
Cal. Y 42.5mp	ear: h 75f	1992 An: 0%CS	I/M ti-tam.	Region Program Program	: Low : No : No	Ar Oper	Altin mbient 1 rating P	tude: ! femp: fode:	500. Ft. 75.0 / 0.0 /	/ 75.0 0.0	75.0 F
Cal. Y 42.5mp	ear: h 751	1992 An: 0%CS	l/M ti-tam. Minim	Region Program Program mum Temp	: Low : No : No : 59.	Ar Oper (F) Ma	Altin mbient 1 rating P aximum 1	tude: ! femp: fode: femp: 9	500. Ft. 75.0 / 0.0 / 1. (F)	75.0 / 0.0 /	75.0 F 0.0
Cal. Y 42.5mp	ear: h 751	1992 An: 0%CS	I/M ti-tam. Minin Perio	Region Program Program mum Temp od 1 RVP	: Low : No : No : 59. : 11.5	Ar Oper (F) Ma Pe	Altin mbient 1 rating P aximum 1 eriod 2	tude: ! femp: fode: femp: 9 RVP: 1	500. Ft. 75.0 / 0.0 / 1. (F) 1.5 Peri	75.0 / 0.0 /	75.0 F 0.0 7: 1988
Cal. Y 42.5mp Veh. T	ear: h 75f ype:	1992 An: 0%CS	I/M ti-tam. Minin Perin LDGT1	Region Program Program mum Temp od 1 RVP LDGT2	:: Low :: No :: No :: 59. :: 11.5 LDGT	Ar Oper (F) Ma Po HDGV	Altin mbient 1 rating 1 aximum 1 eriod 2 LDDV	tude: ! femp: fode: femp: 9 RVP: 1 LDDT	500. Ft. 75.0 / 0.0 / 1. (F) 1.5 Peri HDDV	75.0 / 0.0 / iod 2 Y	75.0 F 0.0 7r: 1988 All Veh
Cal. Y 42.5mp Veh. T	ear: h 75f ype:	1992 An: 0%CS LDGV	I/M ti-tam. Miniu Periu LDGT1	Region Program Program mum Temp od 1 RVP LDGT2	:: Low :: No :: No :: 59. : 11.5 LDGT	Ar Oper (F) Ma Pd HDGV	Altin mbient 1 rating) aximum 1 eriod 2 LDDV	tude: ! Temp: Node: Temp: 9 RVP: 1 LDDT	500. Ft. 75.0 / 0.0 / 1. (F) 1.5 Peri HDDV	75.0 / 0.0 / iod 2 Y	75.0 F 0.0 7r: 1988 All Veh
Cal. Y 42.5mp Veh. T Veh. S	ear: h 757 ype: pd.:	1992 An: 0XCS LDGV 42.5	I/M ti-tam. Minin Perin LDGT1 42.5	Region Program Program num Temp od 1 RVP LDGT2 42.5	:: Low :: No :: No :: 59. :: 11.5 LDGT	Ar Oper (F) Ma HDGV 42.5	Altin mbient 1 rating) aximum 1 eriod 2 LDDV 42.5	tude: ! femp: fode: femp: 9 RVP: 1 LDDT 42.5	500. Ft. 75.0 / 0.0 / 1. (F) 1.5 Peri HDDV 42.5	75.0 / 0.0 / iod 2 Y MC 42.5	75.0 F 0.0 7r: 1988 All Veh
Cal. Y 42.5mp Veh. T Veh. S VMT	ear: h 758 ype: pd.: Mix:	1992 Ant 0XCS LDGV 42.5 0.870	I/M ti-tam. Minin Perio LDGT1 42.5 0.000	Region Program Program mum Temp od 1 RVP LDGT2 42.5 0.000	:: Low :: No :: No :: 59. : 11.5 LDGT	Ar Oper (F) Ma Po HDGV 42.5 0.000	Altin mbient 1 rating P eriod 2 LDDV 42.5 0.000	tude: ! femp: fode: femp: 9' RVP: 1' LDDT 42.5 0.000	500. Ft. 75.0 / 0.0 / 1. (F) 1.5 Peri HDDV 42.5 0.130	75.0 / 0.0 / iod 2 Y MC 42.5 0.000	75.0 F 0.0 7r: 1988 All Veh
Cal. Y 42.5mp Veh. T Veh. S VMT Compos	ear: h 75f ype: pd.: Mix: ite E	1992 Ant 0XCS LDGV 42.5 0.870 Emission	I/M ti-tam. Minin Perin LDGT1 42.5 0.000 Factor	Region Program Program mum Temp od 1 RVP LDGT2 42.5 0.000 rs (Gm/M	:: Low :: No :: S9. :: 11.5 LDGT 	Ar Oper (F) Ma PC HDGV 42.5 0.000	Altin mbient 1 rating P eriod 2 LDDV 42.5 0.000	tude: femp: fode: RVP: 1 LDDT 42.5 0.000	500. Ft. 75.0 / 0.0 / 1. (F) 1.5 Peri HDDV 42.5 0.130	75.0 / 0.0 / iod 2 Y MC 42.5 0.000	75.0 F 0.0 7r: 1988 All Veh
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Cal. Y 42.5mp Veh. T Veh. S VMT I Compos Total Exhst	ear: h 75f ype: pd.: Mix: ite E HC: HC:	1992 An: 0xcs LDGV 42.5 0.870 mission 2.10 0.54	1/M ti-tam. Minin Perin LDGT1 42.5 0.000 Factor 2.25 0.63	Region Program Program mum Temp od 1 RVP LDGT2 42.5 0.000 rs (Gm/M 3.40 0.82	: Low : No : No : 59. : 11.5 LDGT	Ar Oper (F) Ma P(HDGV 42.5 0.000 8.56 1.53	Altin mbient 1 rating P aximum 1 eriod 2 LDDV 42.5 0.000 0.35 0.35	tude: 9 Temp: 4 dode: Temp: 9 RVP: 1 LDDT 42.5 0.000 0.47 0.47	500. Ft. 75.0 / 0.0 / 1. (F) 1.5 Peri HDDV 42.5 0.130 1.36 1.36	75.0 / 0.0 / iod 2 Y MC 42.5 0.000 5.05 1.11	75.0 F 0.0 7r: 1988 All Veh 2.00 0.65
Cal. Y 42.5mp Veh. T Veh. S VMT I Compos Total Exhst Evap.	ear: h 75f ype: pd.: Mix: ite E HC: HC: HC:	1992 An: 0xcs LDGV 42.5 0.870 5.10 0.54 1.20	I/M ti-tam. Minin Peri LDGT1 42.5 0.000 Factor 2.25 0.63 1.29	Region Program Program mum Temp od 1 RVP LDGT2 42.5 0.000 rs (Gm/M 3.40 0.82 2.17	: Low : No : S9. : 11.5 LDGT ile) 0.00 0.00 0.00	Ar Open (F) Ma Pr HDGV 42.5 0.000 8.56 1.53 6.42	Altin mbient 1 rating P aximum 1 eriod 2 LDDV 42.5 0.000 0.35 0.35	tude: 9 Temp: 4 dode: Temp: 9 RVP: 1 LDDT 42.5 0.000 0.47 0.47	500. Ft. 75.0 / 0.0 / 1. (F) 1.5 Peri HDDV 42.5 0.130 1.36 1.36	75.0 / 0.0 / iod 2 Y MC 42.5 0.000 5.05 1.11 3.48	75.0 F 0.0 7r: 1988 All Veh 2.00 0.65 1.04
Cal. Y 42.5mp Veh. T Veh. S VMT Compos Total Exhst Evap. Evap. Refuel	ear: h 75f ype: pd.: Mix: ite E HC: HC: HC: HC:	1992 Anti- 0XCS LDGV 42.5 0.870 cmission 2.10 0.54 1.20 0.00	I/M ti-tam. Minin Peri LDGT1 42.5 0.000 Factor 2.25 0.63 1.29 0.00	Region Program Program num Temp od 1 RVP LDGT2 42.5 0.000 rs (Gm/M 3.40 0.82 2.17 0.00	: Low : No : S9. : 11.5 LDGT ile) 0.00 0.00 0.00 0.00	Ar Oper (F) Ma Po HDGV 42.5 0.000 8.56 1.53 6.42 0.00	Altin mbient 1 rating P aximum 1 eriod 2 LDDV 42.5 0.000 0.35 0.35	tude: ! femp: fode: femp: 9' RVP: 1' LDDT 42.5 0.000 0.47 0.47	500. Ft. 75.0 / 0.0 / 1. (F) 1.5 Peri HDDV 42.5 0.130 1.36 1.36	75.0 / 0.0 / iod 2 Y MC 42.5 0.000 5.05 1.11 3.48	75.0 F 0.0 7r: 1988 All Veh 2.00 0.65 1.04 0.00
Cal. Y 42.5mp Veh. T Veh. S VMT Compos Total Exhst Evap. Refuel Runing	ear: h 75f pd.: Mix: ite E HC: HC: HC: HC: HC:	1992 Anti- 0XCS LDGV 42.5 0.870 2.10 0.54 1.20 0.00 0.25	I/M ti-tam. Minin Perin LDGT1 42.5 0.000 Factor 2.25 0.63 1.29 0.00 0.23	Region Program Program num Temp od 1 RVP LDGT2 42.5 0.000 rs (Gm/M 3.40 0.82 2.17 0.00 0.30	:: Low :: No :: No :: 59. : 11.5 LDGT 0.00 0.00 0.00 0.00 0.00	Ar Oper (F) Ma Po HDGV 42.5 0.000 8.56 1.53 6.12 0.00 0.49	Altin mbient 1 rating P aximum 1 eriod 2 LDDV 42.5 0.000 0.35 0.35	tude: femp: fode: femp: 9' RVP: 1' LDDT 42.5 0.000 0.47 0.47	500. Ft. 75.0 / 0.0 / 1. (F) 1.5 Peri HDDV 42.5 0.130 1.36 1.36	75.0 / 0.0 / iod 2 Y MC 42.5 0.000 5.05 1.11 3.48	75.0 F 0.0 7r: 1988 All Veh 2.00 0.65 1.04 0.00 0.22
Cal. Y 42.5mp Veh. T Veh. S VMT Compos Total Exhst Evap. Refuel Runing Rsting	ear: h 75f ype: pd.: Mix: ite E HC: HC: HC: HC: HC: HC:	1992 Anti- 0XCS LDGV 42.5 0.870 2.10 0.54 1.20 0.00 0.25 0.11	I/M ti-tam. Minin Perin LDGT1 42.5 0.000 Factor 2.25 0.63 1.29 0.00 0.23 0.09	Region Program Program num Temp od 1 RVP LDGT2 42.5 0.000 rs (Gm/M 3.40 0.82 2.17 0.00 0.30 0.10	:: Low :: No :: S9. :: 11.5 LDGT 	Ar Oper (F) Ma Po HDGV 42.5 0.000 8.56 1.53 6.42 0.00 0.49 0.13	Altin mbient 1 aximum 1 eriod 2 LDDV 42.5 0.000 0.35 0.35	tude: 9 femp: 9 RVP: 1 LDDT 42.5 0.000 0.47 0.47	500. Ft. 75.0 / 0.0 / 1. (F) 1.5 Peri HDDV 42.5 0.130 1.36 1.36	75.0 / 0.0 / iod 2 Y MC 42.5 0.000 5.05 1.11 3.48 0.46	75.0 F 0.0 7r: 1988 All Veh 2.00 0.65 1.04 0.02 0.22 0.10
Cal. Y 42.5mp Veh. T Veh. S VMT Compos Total Exhst Evap. Refuel Runing Rsting Exhst	ear: h 75F ype: pd.: Mix: ite E HC: HC: HC: HC: CO:	1992 Anti- 0XCS LDGV 42.5 0.870 2.10 0.54 1.20 0.054 1.20 0.25 0.11 5.62	I/M ti-tam. Minin Perin LDGT1 42.5 0.000 Factor 2.25 0.63 1.29 0.00 0.23 0.09 0.00	Region Program Program Mum Temp od 1 RVP LDGT2 42.5 0.000 rs (Gm/M 3.40 0.82 2.17 0.08 2.17 0.30 0.30 0.10 0.00	:: Low :: No :: S9. : 11.5 LDGT 0.00 0.00 0.00 0.00 0.00 0.00 0.00	Ar Oper (F) Ma Po HDGV 42.5 0.000 8.56 1.53 6.42 0.00 0.49 0.13 0.00	Altin mbient 1 aximum 1 eriod 2 LDDV 42.5 0.000 0.35 0.35	tude: femp: fode: femp: 9' RVP: 1' LDDT 42.5 0.000 0.47 0.47	500. Ft. 75.0 / 0.0 / 1. (F) 1.5 Peri HDDV 42.5 0.130 1.36 1.36	75.0 / 0.0 / eod 2 Y MC 42.5 0.000 5.05 1.11 3.48 0.46 0.00	75.0 F 0.0 7r: 1988 All Veh 2.00 0.65 1.04 0.02 0.10 5.67
Cal. Y 42.5mp Veh. T Veh. S VMT Compos Total Exhst Evap. Refuel Runing Rsting Exhst Exhst	ear: h 75f ype: pd.: hC: hC: hC: hC: hC: hC: hC: hC: hC: hC	1992 Ant 0XCS LDGV 42.5 0.870 2.10 0.54 1.20 0.054 1.20 0.25 0.11 5.62 0.76	I/M ti-tam. Minin Perin LDGT1 42.5 0.000 Facton 2.25 0.63 1.29 0.00 0.23 0.09 0.00 0.00	Region Program Program Mum Temp od 1 RVP LDGT2 42.5 0.000 rs (Gm/M 3.40 0.82 2.17 0.00 0.30 0.10 0.00 0.00	:: Low :: No :: S9. :: 11.5 LDGT 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00	Ar Oper (F) Ma Po HDGV 42.5 0.000 8.56 1.53 6.42 0.00 0.49 0.13 0.00 0.00	Altin mbient 1 rating) aximum 1 eriod 2 LDDV 42.5 0.000 0.35 0.35 0.35	tude: femp: fode: femp: 9' RVP: 1' LDDT 42.5 0.000 0.47 0.47 0.47 0.00 0.00	500. Ft. 75.0 / 0.0 / 1. (F) 1.5 Peri HDDV 42.5 0.130 1.36 1.36 1.36 6.02 14.48	75.0 / 0.0 / MC 42.5 0.000 5.05 1.11 3.48 0.46 0.00 0.00	75.0 F 0.0 7r: 1988 All Veh 2.00 0.65 1.04 0.02 0.10 5.67 2.55
Cal. Y 42.5mp Veh. T Veh. S VMT Compos Total Exhst Evap. Refuel Runing Rsting Exhst Exhst Hot St	ear: h 75 ype: pd.: HC: HC: HC: HC: HC: NOX: abili	1992 Ant 0XCS LDGV 42.5 0.870 2.10 0.54 1.20 0.05 0.11 5.62 0.76 ized Id	I/M ti-tam. Minin Perin LDGT1 42.5 0.000 Factor 2.25 0.63 1.29 0.00 0.23 0.00 0.23 0.00 0.00 0.00	Region Program Program Mum Temp od 1 RVP LDGT2 42.5 0.000 rs (Gm/M 3.40 0.82 2.17 0.00 0.30 0.10 0.00 0.00 sion Fac	:: Low :: No :: No :: 59. : 11.5 LDGT 00 0.000 0.	Ar Oper (F) Ma Po HDGV 42.5 0.000 8.56 1.53 6.42 0.00 0.49 0.13 0.00 0.00 Gm/Hr)	Altin mbient 1 rating) aximum 1 eriod 2 LDDV 42.5 0.000 0.35 0.35 0.35	tude: 9 femp: 9 RVP: 1 LDDT 42.5 0.000 0.47 0.47 0.47	500. Ft. 75.0 / 0.0 / 1. (F) 1.5 Peri HDDV 42.5 0.130 1.36 1.36 1.36	75.0 / 0.0 / MC 42.5 0.000 5.05 1.11 3.48 0.46 0.00 0.00	75.0 F 0.0 7r: 1988 All Veh 2.00 0.65 1.04 0.00 0.22 0.10 5.67 2.55
Cal. Y 42.5mp Veh. T Veh. S VMT I Compos Total Exhst Evap. Refuel Runing Rsting Exhst Exhst Hot St Idle	ear: h 75f ype: pd.: hC: HC: HC: HC: NOX: abili HC:	1992 An: 0XCS LDGV 42.5 0.870 2.10 0.54 1.20 0.00 0.25 0.11 5.62 0.76 ized Id 24.27	I/M ti-tam. Minin Perin LDGT1 42.5 0.000 Facton 2.25 0.63 1.29 0.00 0.23 0.00 0.23 0.00 0.00 0.00 0.00	Region Program Program Mum Temp od 1 RVP LDGT2 42.5 0.000 rs (Gm/M 3.40 0.82 2.17 0.00 0.30 0.10 0.00 0.00 sion Fac 0.00	:: Low :: No :: No :: 59. :: 11.5 LDGT 00 0.	Ar Oper (F) Ma Pd HDGV 42.5 0.000 8.56 1.53 6.42 0.00 0.49 0.13 0.00 0.00 Gm/Hr) 0.00	Altin mbient 1 rating) aximum 1 eriod 2 LDDV 42.5 0.000 0.35 0.35 0.35 0.00 0.00 0.00	tude: femp: fode: femp: 9' RVP: 1' LDDT 42.5 0.000 0.47 0.47 0.47 0.00 0.00 0.00 0.00	500. Ft. 75.0 / 0.0 / 1. (F) 1.5 Peri HDDV 42.5 0.130 1.36 1.36 1.36 1.36 1.4.48 17.37	75.0 / 0.0 / iod 2 Y MC 42.5 0.000 5.05 1.11 3.48 0.46 0.00 0.00	75.0 F 0.0 7: 1988 All Veh 2.00 0.65 1.04 0.00 0.22 0.10 5.67 2.55 23.37
Cal. Y 42.5mp Veh. T Veh. S VMT I Compos Total Exhst Exhst Exhst Exhst Exhst Hot St Idle Idle	ear: h 75f ype: pd.: Mix: ite E HC: HC: HC: HC: HC: CO: abili HC: CO:2	1992 Ann 0XCS LDGV 42.5 0.870 0.54 1.20 0.00 0.25 0.11 5.62 0.26 1.20 0.25 0.11 5.62 0.24.27 293.10	I/M ti-tam. Minin Perin LDGT1 42.5 0.000 Facto 2.25 0.63 1.29 0.00 0.23 0.09 0.00 0.00 le Emiss 0.00 0.00	Region Program Program mum Temp od 1 RVP LDGT2 42.5 0.000 rs (Gm/M 3.40 0.82 2.17 0.00 0.30 0.10 0.00 0.00 0.00	:: Low :: No :: No :: 59. : 11.5 LDGT 	Ar Oper (F) Ma Pd HDGV 42.5 0.000 8.56 1.53 6.42 0.00 0.49 0.13 0.00 0.00 Gm/Hr) 0.00	Altin mbient 1 rating) aximum 1 eriod 2 LDDV 42.5 0.000 0.35 0.35 0.35 0.00 0.00 0.00 0	tude: 9 femp: 9 RVP: 1 LDDT 42.5 0.000 0.47 0.47 0.47 0.00 0.00 0.00 0.0	500. Ft. 75.0 / 0.0 / 1. (F) 1.5 Peri HDDV 42.5 0.130 1.36 1.36 1.36 1.36 1.36 1.36	75.0 / 0.0 / iod 2 Y MC 42.5 0.000 5.05 1.11 3.48 0.46 0.00 0.00 0.00	75.0 F 0.0 7r: 1988 All Veh 2.00 0.65 1.04 0.00 0.22 0.10 5.67 2.55 23.37 261.65
Cal. Y 42.5mp Veh. T Veh. S VMT i Compos Total Exhst Exhst Exhst Exhst Refuel Runing Rsting Exhst Idle Idle	ear: h 75f ype: pd.: Mix: ite E HC: HC: HC: HC: CO: NOX: NOX:	1992 Anti- 0XCS LDGV 42.5 0.870 0.54 1.20 0.00 0.25 0.11 5.62 0.76 ized Id 24.27 293.10 2.90	I/M ti-tam. Minin Perin LDGT1 42.5 0.000 Factor 2.25 0.63 1.29 0.00 0.23 0.09 0.00 0.00 Le Emiss 0.00 0.00	Region Program Program mum Temp od 1 RVP LDGT2 42.5 0.000 rs (Gm/M 3.40 0.82 2.17 0.00 0.30 0.10 0.00 0.00 sion Fac 0.00 0.00 0.00	:: Low :: No :: No :: 59. : 11.5 LDGT 0.00	Ar Open (F) He HDGV 42.5 0.000 8.56 1.53 6.42 0.00 0.49 0.13 0.00 0.49 0.13 0.00 0.00 Gm/Hr) 0.00 0.00	Altin mbient 1 rating) aximum 1 eriod 2 LDDV 42.5 0.000 0.35 0.35 0.35 0.35 0.00 0.00 0	tude: femp: fode: femp: 9 RVP: 1 LDDT 42.5 0.000 0.47 0.47 0.47 0.47 0.00 0.00 0.00 0.00 0.00	500. Ft. 75.0 / 0.0 / 1. (F) 1.5 Peri HDDV 42.5 0.130 1.36 1.36 1.36 1.36 1.36 1.36 1.36	75.0 / 0.0 / iod 2 Y MC 42.5 0.000 5.05 1.11 3.48 0.46 0.00 0.00 0.00 0.00 0.00	75.0 F 0.0 7r: 1988 All Veh 2.00 0.65 1.04 0.00 0.22 0.10 5.67 2.55 23.37 261.65 5.43

Cal Vear	1007		Pasies	. 1.04		A1+:4	ude. C	500 E+		
Lat. rear:	1992	1 /14	Decaron	No		ALLI mbiont		75 0 /	75.0	75 0 5
	4-1	1/m	Program	NO	0000		ledo:	0.0/	0.07	10.0 F
15 0mmh 75	- 0405	LI-Lain.	Filligian	. NO	oper	ating	ioue.	0.0 /	0.0 /	0.0
43.00pt 73	UACS	Minir	w m Tomo	. 50		vimm 1		1 (5)		
		Peri	ndii remp ndi 1 DVD	• 11 5		aciod 2	DVD - 1	1 5 Peri	~ 2 V	r. 1088
	IDGV	IDGT1			HDGV		IDDT			All Veh
ven. Type.		COULT	LUGIL	LUGI	nouv	2001	2001	1001		
Veh Sod .	45 0	45 0	45 0		45 0	45.0	45 0	45 0	45 0	
VMT Mix.	0 870	0.000	0 000		0.000	0.000	0 000	0 130	0 000	1
Composite	Emissio	n Facto	rs (Gm/M	ile)	0.000	0.000	0.000	0.150	0.000	,
Total HC:	2.05	2.19	3.32	0.00	8.43	0.34	0.45	1.31	5.03	1.95
Exhst HC:	0.51	0.59	0.77	0.00	1.44	0.34	0.45	1.31	1.09	0.62
Evap. HC:	1.20	1.29	2.17	0.00	6.42				3.48	1.04
Refuel HC:	0.00	0.00	0.00	0.00	0.00					0.00
Runing HC:	0.23	0.22	0.28	0.00	0.45					0.20
Rsting HC:	0.11	0.09	0.10	0.00	0.13				0.46	0.10
Exhst CO:	5.18	0.00	0.00	0.00	0.00	0.00	0.00	5.90	0.00	5.27
Exhst NOX:	0.76	0.00	0.00	0.00	0.00	0.00	0.00	15.00	0.00	2.61
Hot Stabil	ized Id	le Emis	sion Fac	tors (Gm/Hr)		•			
Idle HC:	24.27	0.00	0.00	0.00	0.00	0.00	0.00	17.37	0.00	23.37
Idle CO:	293.10	0.00	0.00	0.00	0.00	0.00	0.00	51.18	0.00	261.65
Idle NOX:	2.90	0.00	0.00	0.00	0.00	0.00	0.00	22.32	0.00	5.43
eteration and the second second										
Cal. Year:	1992		Region	: Low		Alti	tude:	500. Ft.	(⁻	
Cal. Year:	1992	1/M	Region Program	: Low : No	A	Alti mbient	tude: ! femp:	500. Ft. 75.0 /	75.0 /	75.0 F
Cal. Year:	1992 An	I/M ti-tam.	Region Program Program	: Low : No : No	Ar Ope	Alti mbient rating I	tude: ! femp: lode:	500. Ft. 75.0 / 0.0 /	75.0 / 0.0 /	75.0 F
Cal. Year: 47.5mph 75	1992 An F 0%CS	I/M ti-tam.	Region Program Program	: Low : No : No	A Ope	Alti mbient rating I	tude: ! femp: lode:	500. Ft. 75.0 / 0.0 /	75.0 / 0.0 /	75.0 F 0.0
Cal. Year: 47.5mph 75	1992 An F 0%CS	I/M ti-tam. Miniu	Region Program Program mum Temp	:: Low :: No :: No :: 59.	Ar Ope (F) M	Alti mbient rating I aximum	tude: ! Temp: 1ode: Temp: 9	500. Ft. 75.0 / 0.0 / 1. (F)	75.0 / 0.0 /	75.0 F 0.0
Cal. Year: 47.5mph 75	1992 An F 0%CS	I/M ti-tam. Minii Perii	Region Program Program mum Temp od 1 RVP	:: Low :: No :: No :: 59. : 11.5	Ar Ope (F) M	Alti mbient rating I aximum eriod 2	tude: ! Temp: 4ode: Temp: 9' RVP: 1'	500. Ft. 75.0 / 0.0 / 1. (F) 1.5 Peri	75.0 / 0.0 /	75.0 F 0.0
Cal. Year: 47.5mph 75 Veh. Type:	1992 An F OXCS LDGV	I/M ti-tam. Minin Perin LDGT1	Region Program Program mum Temp od 1 RVP LDGT2	: Low : No : No : 59. : 11.5 LDGT	Ar Ope (F) M HDGV	Alti mbient rating I aximum eriod 2 LDDV	tude: ! Temp: fode: femp: 9' RVP: 1' LDDT	500. Ft. 75.0 / 0.0 / 1. (F) 1.5 Peri HDDV	75.0 / 0.0 / od 2 1 MC	75.0 F 0.0 7: 1988 All Veh
Cal. Year: 47.5mph 75 Veh. Type:	1992 An F 0%CS LDGV	I/M ti-tam. Minin Perin LDGT1	Region Program Program mum Temp od 1 RVP LDGT2	:: Low :: No :: No :: 59. : 11.5 LDGT	Ar Ope (F) M HDGV	Alti mbient rating I aximum eriod 2 LDDV	tude: ! femp: fode: femp: 9' RVP: 1' LDDT	500. Ft. 75.0 / 0.0 / 1. (F) 1.5 Peri HDDV	75.0 / 0.0 / od 2 1 MC	75.0 F 0.0 7: 1988 All Veh
Cal. Year: 47.5mph 75 Veh. Type: Veh. Spd.:	1992 An F 0%CS LDGV 47.5	I/M ti-tam. Minin Perio LDGT1 47.5	Region Program Program mum Temp od 1 RVP LDGT2 47.5	: Low : No : No : 59. : 11.5 LDGT	Ar Ope (F) M HDGV 47.5	Altimbient rating f aximum eriod 2 LDDV	tude: ! femp: fode: femp: 9 RVP: 1 LDDT 47.5	500. Ft. 75.0 / 0.0 / 1. (F) 1.5 Peri HDDV 47.5	75.0 / 0.0 / od 2 1 MC	75.0 F 0.0 7: 1988 All Veh
Cal. Year: 47.5mph 75 Veh. Type: Veh. Spd.: VMT Mix:	1992 An F 0%CS LDGV 47.5 0.870	I/M ti-tam. Minin Perin LDGT1 47.5 0.000	Region Program Program mum Temp od 1 RVP LDGT2 47.5 0.000	:: Low :: No :: No :: 59. : 11.5 LDGT	Ar Ope (F) M HDGV 47.5 0.000	Altimbient rating f aximum eriod 2 LDDV 47.5 0.000	tude: femp: fode: femp: 9 RVP: 1 LDDT 47.5 0.000	500. Ft. 75.0 / 0.0 / 1. (F) 1.5 Peri HDDV 47.5 0.130	75.0 / 0.0 / od 2 1 MC 47.5 0.000	75.0 F 70.0 7r: 1988 All Veh
Cal. Year: 47.5mph 75 Veh. Type: Veh. Spd.: VMT Mix: Composite HC:	1992 An: F 0%CS LDGV 47.5 0.870 Emission 2 00	I/M ti-tam. Minin Perin LDGT1 47.5 0.000 n Facto 2 13	Region Program Program mum Temp od 1 RVP LDGT2 47.5 0.000 rs (Gm/M	:: Low :: No :: S9. :: 11.5 LDGT ile) 0.00	Ar Ope (F) M HDGV 47.5 0.000	Alti mbient rating I aximum eriod 2 LDDV 47.5 0.000	tude: ! femp: fode: femp: 9 RVP: 1 LDDT 47.5 0.000	500. Ft. 75.0 / 0.0 / 1. (F) 1.5 Peri HDDV 47.5 0.130	75.0 / 0.0 / od 2 1 MC 47.5 0.000	75.0 F 70.0 7r: 1988 All Veh
Cal. Year: 47.5mph 75 Veh. Type: Veh. Spd.: VMT Mix: Composite Total HC:	1992 Ani F 0XCS LDGV 47.5 0.870 Emission 2.00 0.49	I/M ti-tam. Minin Perin LDGT1 47.5 0.000 n Factor 2.13 0.55	Region Program Program mum Temp od 1 RVP LDGT2 47.5 0.000 rs (Gm/M 3.25 0 72	:: Low :: No :: S9. :: 11.5 LDGT 0.00 0.00	Ar Ope (F) M. HDGV 47.5 0.000 8.33 1.37	Altimbient rating I aximum eriod 2 LDDV 47.5 0.000 0.33 0.33	tude: ! femp: fomp: 9 RVP: 1 LDDT 47.5 0.000 0.44 0.44	500. Ft. 75.0 / 0.0 / 1. (F) 1.5 Peri HDDV 47.5 0.130 1.26 1 24	75.0 / 0.0 / ocd 2 1 MC 47.5 0.000 5.01	775.0 F 70.0 7r: 1988 All Veh
Cal. Year: 47.5mph 75 Veh. Type: Veh. Spd.: VMT Mix: Composite Total HC: Exhst HC: Even HC:	1992 Ani F 0XCS LDGV 47.5 0.870 Emission 2.00 0.49 1.20	I/M ti-tam. Minin Perin LDGT1 47.5 0.000 n Facto 2.13 0.55 1 20	Region Program Program mum Temp od 1 RVP LDGT2 47.5 0.000 rs (Gm/H 3.25 0.72 2 17	: Low : No : S9. : 11.5 LDGT 0.00 0.00 0.00	Ai Ope (F) Hi HDGV 47.5 0.000 8.33 1.37 6.42	Altimbient rating I aximum eriod 2 LDDV 47.5 0.000 0.33 0.33	tude: ! femp: formp: 9 RVP: 1 LDDT 47.5 0.000 0.44 0.44	500. Ft. 75.0 / 0.0 / 1. (F) 1.5 Peri HDDV 47.5 0.130 1.26 1.26	75.0 / 0.0 / ocd 2 1 MC 47.5 0.000 5.01 1.07 3.48	775.0 F 70.0 7r: 1988 All Veh 1.90 0.59
Cal. Year: 47.5mph 75 Veh. Type: Veh. Spd.: VMT Mix: Composite Total HC: Exap. HC: Evap. HC: Pefuel HC:	1992 Ant F 0%CS LDGV 47.5 0.870 Emission 2.00 0.49 1.20 0.00	I/M ti-tam. Minin Perin LDGT1 47.5 0.000 n Facto 2.13 0.55 1.29 0.00	Region Program Program mum Temp od 1 RVP LDGT2 47.5 0.000 rs (Gm/H 3.25 0.72 2.17 0.00	: Low : No : No : 59. : 11.5 LDGT	Ai Ope (F) M: HDGV 47.5 0.000 8.33 1.37 6.42 0.00	Alti mbient rating I aximum eriod 2 LDDV 47.5 0.000 0.33 0.33	tude: ! femp: 4ode: femp: 9 RVP: 1 LDDT 47.5 0.000 0.44 0.44	500. Ft. 75.0 / 0.0 / 1. (F) 1.5 Peri HDDV 47.5 0.130 1.26 1.26	75.0 / 0.0 / ocd 2 1 MC 47.5 0.000 5.01 1.07 3.48	775.0 F 70.0 7r: 1988 All Veh 1.90 0.59 1.04 0.00
Cal. Year: 47.5mph 75 Veh. Type: Veh. Spd.: VHT Mix: Composite Total HC: Exhst HC: Evap. HC: Refuel HC: Purping HC:	1992 Ant F 0%CS LDGV 47.5 0.870 Emission 2.00 0.49 1.20 0.00 0.20	I/M ti-tam. Minin Perin LDGT1 47.5 0.000 n Factor 2.13 0.55 1.29 0.00 0.20	Region Program Program mum Temp od 1 RVP LDGT2 47.5 0.000 rs (Gm/M 3.25 0.72 2.17 0.00 0 26	: Low : No : No : 59. : 11.5 LDGT	Ai Ope (F) M. HDGV 47.5 0.000 8.33 1.37 6.42 0.00 0.42	Alti mbient rating I aximum eriod 2 LDDV 47.5 0.000 0.33 0.33	tude: ! femp: 4ode: Femp: 9 RVP: 1 LDDT 47.5 0.000 0.44 0.44	500. Ft. 75.0 / 0.0 / 1. (F) 1.5 Peri HDDV 47.5 0.130 1.26 1.26	75.0 / 0.0 / ocd 2 1 MC 47.5 0.000 5.01 1.07 3.48	775.0 F 0.0 7r: 1988 All Veh 1.90 0.59 1.04 0.00 0.18
Cal. Year: 47.5mph 75 Veh. Type: Veh. Spd.: VHT Mix: Composite Total HC: Exhst HC: Evap. HC: Runing HC: Reting HC:	1992 Ant F 0%CS LDGV 47.5 0.870 Emission 2.00 0.49 1.20 0.00 0.20 0.21	I/M ti-tam. Minin Perin LDGT1 47.5 0.000 n Factor 2.13 0.55 1.29 0.00 0.20	Region Program Program mum Temp od 1 RVP LDGT2 47.5 0.000 rs (Gm/M 3.25 0.72 2.17 0.00 0.26 0.10	:: Low :: No :: No :: 59. : 11.5 LDGT 	Ai Ope (F) M. HDGV 47.5 0.000 8.33 1.37 6.42 0.00 0.42 0.13	Alti mbient rating I aximum eriod 2 LDDV 47.5 0.000 0.33 0.33	tude: ! femp: 4ode: Femp: 9 RVP: 1 LDDT 47.5 0.000 0.44 0.44	500. Ft. 75.0 / 0.0 / 1. (F) 1.5 Peri HDDV 47.5 0.130 1.26 1.26	75.0 / 0.0 / od 2 1 MC 47.5 0.000 5.01 1.07 3.48	75.0 F 0.0 7: 1988 All Veh 1.90 0.59 1.04 0.00 0.18 0.10
Cal. Year: 47.5mph 75 Veh. Type: Veh. Spd.: VHT Mix: Composite I Total HC: Exhst HC: Evap. HC: Refuel HC: Runing HC: Rsting HC:	1992 Ant F 0%CS LDGV 47.5 0.870 Emission 2.00 0.49 1.20 0.49 1.20 0.20 0.20 0.20	I/M ti-tam. Minin Peri LDGT1 47.5 0.000 n Facto 2.13 0.55 1.29 0.00 0.20 0.20 0.00	Region Program Program mum Temp od 1 RVP LDGT2 	:: Low :: No :: No :: 59. : 11.5 LDGT 	Ai Ope (F) Mi HDGV 47.5 0.000 8.33 1.37 6.42 0.00 0.42 0.13 0.00	Alti mbient rating I aximum eriod 2 LDDV 47.5 0.000 0.33 0.33	tude: ! femp: fode: femp: 9' RVP: 1' LDDT 47.5 0.000 0.44 0.44	500. Ft. 75.0 / 0.0 / 1. (F) 1.5 Peri HDDV 47.5 0.130 1.26 1.26	75.0 / 0.0 / ocd 2 1 MC 47.5 0.000 5.01 1.07 3.48 0.46 0.00	75.0 F 0.0 7r: 1988 All Veh 1.90 0.59 1.04 0.00 0.18 0.10 4.94
Cal. Year: 47.5mph 75 Veh. Type: Veh. Spd.: VHT Mix: Composite Total HC: Exhst HC: Evap. HC: Refuel HC: Runing HC: Exhst CO: Exhst NOX:	1992 Ant F 0%CS LDGV 47.5 0.870 Emission 2.00 0.49 1.20 0.49 1.20 0.20 0.20 0.20 0.77	I/M ti-tam. Minin Peri LDGT1 47.5 0.000 n Facto 2.13 0.55 1.29 0.00 0.20 0.20 0.20 0.00 0.00	Region Program Program mum Temp od 1 RVP LDGT2 	:: Low :: No :: No :: 59. : 11.5 LDGT 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00	Ai Ope (F) Mi HDGV 47.5 0.000 8.33 1.37 6.42 0.00 0.42 0.13 0.00 0.00	Alti mbient rating I aximum eriod 2 LDDV 47.5 0.000 0.33 0.33 0.33	tude: ! femp: fode: femp: 97 RVP: 1 LDDT 47.5 0.000 0.44 0.44	500. Ft. 75.0 / 0.0 / 1. (F) 1.5 Peri HDDV 47.5 0.130 1.26 1.26 5.84 15.68	75.0 / 0.0 / ocd 2 1 MC 47.5 0.000 5.01 1.07 3.48 0.46 0.00 0.00	75.0 F 0.0 7: 1988 All Veh 1.90 0.59 1.04 0.00 0.18 0.10 4.94 2.70
Cal. Year: 47.5mph 75 Veh. Type: Veh. Spd.: VHT Mix: Composite Total HC: Exhst HC: Evap. HC: Refuel HC: Runing HC: Rsting HC: Exhst CO: Exhst NOX: Hot Stabil	1992 Antr F 0%CS LDGV 47.5 0.870 Emission 2.00 0.49 1.20 0.00 0.20 0.20 0.11 4.80 0.77 ized Id	I/M ti-tam. Minin Peri LDGT1 47.5 0.000 n Factor 2.13 0.55 1.29 0.00 0.20 0.20 0.20 0.00 0.00 0.00 le Emis	Region Program Program mum Temp od 1 RVP LDGT2 	:: Low :: No :: No :: 59. : 11.5 LDGT 	Ai Ope (F) Mi HDGV 47.5 0.000 8.33 1.37 6.42 0.00 0.42 0.13 0.00 0.00 Gm/Hr)	Alti mbient r rating l aximum r eriod 2 LDDV 47.5 0.000 0.33 0.33 0.00 0.00	tude: ! femp: 40de: femp: 97 RVP: 1 LDDT 47.5 0.000 0.44 0.44 0.00 0.00	500. Ft. 75.0 / 0.0 / 1. (F) 1.5 Peri HDDV 47.5 0.130 1.26 1.26 5.84 15.68	75.0 / 0.0 / MC 47.5 0.000 5.01 1.07 3.48 0.46 0.00 0.00	75.0 F 0.0 7r: 1988 All Veh 1.90 0.59 1.04 0.00 0.18 0.10 4.94 2.70
Cal. Year: 47.5mph 75 Veh. Type: Veh. Spd.: VHT Mix: Composite Total HC: Exhst HC: Evap. HC: Refuel HC: Runing HC: Rsting HC: Exhst CO: Exhst NOX: Hot Stabil Idle HC:	1992 Ant F 0%CS LDGV 47.5 0.870 Emission 2.00 0.49 1.20 0.00 0.20 0.20 0.11 4.80 0.77 ized Id 24.27	I/M ti-tam. Minin Peri LDGT1 47.5 0.000 n Factor 2.13 0.55 1.29 0.00 0.20 0.20 0.20 0.09 0.00 0.00 0	Region Program Program mum Temp od 1 RVP LDGT2 	:: Low :: No :: No :: 59. : 11.5 LDGT 	Ai Ope (F) Mi HDGV 47.5 0.000 8.33 1.37 6.42 0.00 0.42 0.13 0.00 0.00 Gm/Hr) 0.00	Alti mbient r rating I aximum r eriod 2 LDDV 47.5 0.000 0.33 0.33 0.33	tude: ! femp: fode: femp: 9' RVP: 1' LDDT 47.5 0.000 0.44 0.44 0.44	500. Ft. 75.0 / 0.0 / 1. (F) 1.5 Peri HDDV 47.5 0.130 1.26 1.26 5.84 15.68 17.37	75.0 / 0.0 / ecd 2 1 MC 47.5 0.000 5.01 1.07 3.48 0.46 0.00 0.00 0.00	75.0 F 0.0 7r: 1988 All Veh 1.90 0.59 1.04 0.00 0.18 0.10 4.94 2.70 23.37
Cal. Year: 47.5mph 75 Veh. Type: Veh. Spd.: VHT Mix: Composite I Total HC: Exhst HC: Evap. HC: Refuel HC: Runing HC: Rsting HC: Exhst NOX: Hot Stabil Idle HC: Idle Co:	1992 Ann F 0%CS LDGV 47.5 0.870 Emission 2.00 0.49 1.20 0.00 0.20 0.20 0.20 0.11 4.80 0.7 ized Id 24.27 293.10	I/M ti-tam. Minin Peri LDGT1 47.5 0.000 n Factor 2.13 0.55 1.29 0.00 0.20 0.20 0.09 0.00 0.00 le Emis: 0.00	Region Program Program mum Temp od 1 RVP LDGT2 	:: Low :: No :: No :: 59. : 11.5 LDGT 	Ai Ope (F) Mi HDGV 47.5 0.000 8.33 1.37 6.42 0.00 0.42 0.13 0.00 0.00 Gm/Hr) 0.00	Alti mbient r rating l aximum eriod 2 LDDV 47.5 0.000 0.33 0.33 0.33 0.00 0.00 0.00 0	tude: ! femp: 40de: femp: 97 RVP: 11 LDDT 47.5 0.000 0.44 0.44 0.44 0.00 0.00 0.00 0	500. Ft. 75.0 / 0.0 / 1. (F) 1.5 Peri HDDV 47.5 0.130 1.26 1.26 1.26 5.84 15.68 17.37 51.18	75.0 / 0.0 / ed 2 1 MC 47.5 0.000 5.01 1.07 3.48 0.46 0.00 0.00 0.00 0.00	75.0 F 0.0 7r: 1988 All Veh 1.90 0.59 1.04 0.00 0.18 0.10 4.94 2.70 23.37 261.65
Cal. Year: 47.5mph 75 Veh. Type: Veh. Spd.: VHT Mix: Composite I Total HC: Exhst HC: Evap. HC: Refuel HC: Runing HC: Exhst CO: Exhst NOX: Hot Stabil Idle HC: Idle NOX:	1992 Ann F 0%CS LDGV 47.5 0.870 Emission 2.00 0.49 1.20 0.00 0.20 0.20 0.11 4.80 0.77 ized Id 24.27 ized Id 24.27	I/M ti-tam. Minin Perin LDGT1 47.5 0.000 n Facton 2.13 0.55 1.29 0.00 0.20 0.09 0.00 0.00 0.00 0.00 0	Region Program Program mum Temp od 1 RVP LDGT2 	:: Low :: No :: No :: 59. : 11.5 LDGT 	Ai Ope (F) Mi HDGV 47.5 0.000 8.33 1.37 6.42 0.00 0.42 0.13 0.00 0.00 Gm/Hr) 0.00 0.00	Alti mbient 7 rating 1 aximum 7 eriod 2 LDDV 47.5 0.000 0.33 0.33 0.33 0.00 0.00 0.00 0	tude: ! femp: 40 femp: 97 RVP: 11 LDDT 47.5 0.000 0.44 0.44 0.44 0.00 0.00 0.00 0	500. Ft. 75.0 / 0.0 / 1. (F) 1.5 Peri HDDV 47.5 0.130 1.26 1.26 1.26 5.84 15.68 17.37 51.18 22.32	75.0 / 0.0 / 0.0 / MC 47.5 0.000 5.01 1.07 3.48 0.46 0.00 0.00 0.00 0.00 0.00	75.0 F 0.0 7r: 1988 All Veh 1.90 0.59 1.04 0.00 0.18 0.10 4.94 2.70 23.37 261.65 5.43

			and the second se				_				
Cal.	Year:	1992		Region	LOW		Alti	tude:	500. Ft.		
			1/M	Program	No No	Ar	nbient '	lemp:	75.0 /	75.0 /	75.0 F
		An	ti-tam.	Program	I: NO	Oper	rating	lode:	0.0/	0.0 /	0.0
50.Om	oh 751	F 0%CS				· .					
			Hinid	num Temp	: 59.	(F) Ma	aximum	Temp: 9	1. (F)		
			Perio	od 1 RVP	: 11.5	Pe	eriod 2	RVP: 1	1.5 Peri	iod 2 Y	r: 1988
Veh.	Type:	LDGV	LDGT1	LDGT2	LDGT	HDGV		IDDT	HDDV	MC	All Veh
	.,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,						2001				
Veb	5 - 102	50.0	50.0	50.0		50.0	50.0	50.0	50.0	50.0	
Ven.	Miv.	0 870	0.000	0 000		0 000	0 000	0 000	0 130	0.00	
Compo			Easta		i la l	0.000	0.000	0.000	0.150	0.000	
Total		2 01	2 15	3 (0117 m	0.00	8 2/	0 72	0 / 2	1 27	5 00	1 01
Exhet	HC.	0.52	0.59	0.76	0.00	1 71	0.32	0.42	1 27	1 15	0.47
EXIST	40.	1 20	1 20	2 17	0.00	4 / 2	0.32	0.42	1.25	7 / 9	1.04
Evap.		0.00	0.00	0.00	0.00	0.42				3.40	0.00
Refue	- 40.	0.00	0.00	0.00	0.00	0.00					0.00
Runin	g HC:	0.10	0.10	0.24	0.00	0.30				• • •	0.10
RSUIN	g nc:	4.7/	0.09	0.10	0.00	0.15	0.00	0.00	F 0F	0.40	0.10
EXASt		0.24	0.00	0.00	0.00	0.00	0.00	0.00	3.03	0.00	0.17
EXAST	NUX:	0.03	0.00	0.00	0.00	0.00	0.00	0.00	10.33	0.00	2.0/
HOT S	Tabil	ized Id	Le Emis	SION Fac	tors (Gm/Hr)					
Idle	HC:	24.21	0.00	0.00	0.00	0.00	0.00	0.00	17.57	0.00	25.57
Idle	CO:	293.10	0.00	0.00	0.00	0.00	0.00	0.00	51.18	0.00	261.65
Idle	NOX:	2.90	0.00	0.00	0.00	0.00	0.00	0.00	22.32	0.00	5.43
A . 1		1000				in the second					
Cal.	Year:	1992		Region	: Low		Alti	tude:	500. Ft.		
Cal.	Year:	1992	1/M	Region Program	I: LOW	Ar	Alti mbient	tude: Temp:	500. Ft. 75.0 /	75.0	75.0 F
Cal.	Year:	1992 An	I/M ti-tam.	Region Program Program	n: Low n: No n: No	Ar Oper	Alti mbient rating	tude: ! Temp: Node:	500. Ft 75.0 / 0.0 /	75.0 / 0.0 /	75.0 F
Cal. 52.5m	Year: ph 75	1992 An F 0%CS	I/M ti-tam.	Region Program Program	1: Low 1: No 1: No	Ar Oper	Alti mbient rating	tude: ! Temp: Node:	500. Ft 75.0 / 0.0 /	75.0 / 0.0 /	75.0 F
Cal. 52.5m	Year: ph 75	1992 An F 0%CS	I/M ti-tam. Miniu	Region Program Program	1: Low 1: No 1: No 1: No 0: 59.	Ar Oper	Alti mbient rating I aximum	tude: ! Temp: Node: Temp: 9	500. Ft. 75.0 / 0.0 / 1. (F)	75.0 / 0.0 /	75.0 F
Cal. 52.5m	Year: ph 75	1992 An F 0%CS	I/M ti-tam. Minin Perio	Region Program Program mum Temp od 1 RVP	1: Low 1: No 1: No 1: No 2: 59. 2: 11.5	Ar Oper (F) Ma Po	Alti mbient rating l aximum eriod 2	tude: Temp: Node: Temp: 9 RVP: 1	500. Ft 75.0 / 0.0 / 1. (F) 1.5 Per	75.0 / 0.0 /	75.0 F 0.0
Cal. 52.5m Veh.	Year: ph 75 Type:	1992 An F O%CS LDGV	I/M ti-tam. Minio Perio LDGT1	Region Program Program mum Temp od 1 RVP LDGT2	1: Low 1: No 1: No 2: 59. 2: 11.5 LDGT	Ar Oper (F) Ma Po HDGV	Alti mbient rating I aximum eriod 2 LDDV	tude: Temp: Mode: Temp: 9 RVP: 1 LDDT	500. Ft 75.0 / 0.0 / 1. (F) 1.5 Per HDDV	75.0 / 0.0 / iod 2 1 MC	75.0 F 0.0 7: 1988 All Veh
Cal. 52.5m Veh.	Year: ph 75 Type:	1992 An F 0%CS LDGV	I/M ti-tam. Minin Perio LDGT1	Region Program Program mum Temp od 1 RVP LDGT2	1: Low 1: No 1: No 2: 59. 2: 11.5 LDGT	Ar Oper (F) Ma Po HDGV	Alti mbient rating I aximum eriod 2 LDDV	tude: Temp: Mode: Temp: 9 RVP: 1 LDDT	500. Ft 75.0 / 0.0 / 1. (F) 1.5 Per HDDV	75.0 / 0.0 / iod 2 1 MC	75.0 F 0.0 (r: 1988 All Veh
Cal. 52.5m Veh. Veh.	Year: ph 75 Type: Spd.:	1992 An F 0%CS LDGV 52.5	I/M ti-tam. Minin Perin LDGT1 52.5	Region Program Program mum Temp od 1 RVP LDGT2 52.5	1: Low 1: No 1: No 2: 59. 2: 11.5 LDGT	Ar Oper (F) Ma Po HDGV 52.5	Alti mbient rating l eximum eriod 2 LDDV 52.5	tude: Temp: Node: Temp: 9 RVP: 1 LDDT 52.5	500. Ft 75.0 / 0.0 / 1. (F) 1.5 Per HDDV 52.5	75.0 / 0.0 / iod 2 1 MC 52.5	75.0 F 0.0 (r: 1988 All Veh
Cal. 52.5m Veh. Veh. VMT	Year: ph 75 Type: Spd.: Mix:	1992 An F 0XCS LDGV 52.5 0.870	I/M ti-tam. Minin Perin LDGT1 52.5 0.000	Region Program Program mum Temp od 1 RVP LDGT2 52.5 0.000	1: LOW 1: NO 1: NO 1: 59. 11.5 LDGT	Ar Oper (F) Ma PC HDGV 52.5 0.000	Alti mbient rating l eximum eriod 2 LDDV 52.5 0.000	tude: 1 Temp: 4 Mode: Temp: 9 RVP: 1 LDDT 52.5 0.000	500. Ft 75.0 / 0.0 / 1. (F) 1.5 Per HDDV 52.5 0.130	75.0 / 0.0 / iod 2 1 MC 52.5 0.000	75.0 F 0.0 (r: 1988 All Veh
Cal. 52.5m Veh. Veh. VHT Compo	Year: ph 75 Type: Spd.: Mix: site 1	1992 An F 0%CS LDGV 52.5 0.870 Emission	I/M ti-tam. Minin Perin LDGT1 52.5 0.000 n Factor	Region Program Program mum Temp od 1 RVP LDGT2 52.5 0.000 rs (Gm/H	1: Low 1: No 1: No 1: 59. 1: 11.5 LDGT	Ar Oper (F) Ma Pr HDGV 52.5 0.000	Alti mbient rating l eriod 2 LDDV 52.5 0.000	tude: 1 Temp: Node: RVP: 1 LDDT 52.5 0.000	500. Ft. 75.0 / 0.0 / 1. (F) 1.5 Per HDDV 52.5 0.130	75.0 / 0.0 / iod 2) MC 52.5 0.000	75.0 F 0.0 (r: 1988 All Veh
Cal. 52.5m Veh. VHT Compo Total	Year: ph 75 Type: Spd.: Mix: site I HC:	1992 An: F 0%CS LDGV 52.5 0.870 Emission 2.05	I/M ti-tam. Minin Peri LDGT1 52.5 0.000 n Factor 2.19	Region Program Program mum Temp od 1 RVP LDGT2 52.5 0.000 rs (Gm/M 3.32	1: Low 1: No 1: No 2: 59. 2: 11.5 LDGT 1: LDGT 0.00	Ar Oper (F) Ma P(HDGV 52.5 0.000 8.16	Alti mbient rating l eximum eriod 2 LDDV 52.5 0.000 0.31	tude: 1 Temp: 4 Mode: Temp: 9 RVP: 1 LDDT 52.5 0.000 0.41	500. Ft. 75.0 / 0.0 / 1. (F) 1.5 Per HDDV 52.5 0.130 1.20	75.0 / 0.0 / MC 52.5 0.000 5.20	75.0 F 0.0 (r: 1988 All Veh 0 1.94
Cal. 52.5m Veh. Veh. VMT Compo Total Exhst	Year: ph 75 Type: Spd.: Mix: site I HC: HC:	1992 An: F 0%CS LDGV 52.5 0.870 Emission 2.05 0.57	I/M ti-tam. Minin Perin LDGT1 52.5 0.000 p Factor 2.19 0.64	Region Program Program mum Temp od 1 RVP LDGT2 52.5 0.000 rs (Gm/H 3.32 0.83	1: Low 1: No 1: No 2: 59. 2: 11.5 LDGT 0.00 0.00	Ar Oper (F) Ma HDGV 52.5 0.000 8.16 1.27	Alti mbient rating l eriod 2 LDDV 52.5 0.000 0.31 0.31	tude: 1 Temp: 9 RVP: 1 LDDT 52.5 0.000 0.41 0.41	500. Ft. 75.0 / 0.0 / 1. (F) 1.5 Per HDDV 52.5 0.130 1.20 1.20	75.0 / 0.0 / iod 2 1 MC 52.5 0.000 5.20 1.26	775.0 F 70.0 (r: 1988 All Veh 1.94 0.65
Cal. 52.5m Veh. VHT Compo Total Exhst Evap.	Year: ph 75 Type: Spd.: Mix: site 1 HC: HC: HC:	1992 An: F 0%CS LDGV 52.5 0.870 Emission 2.05 0.57 1.20	I/H ti-tam. Minin Perin LDGT1 52.5 0.000 Factor 2.19 0.64 1.29	Region Program Program mum Temp od 1 RVP LDGT2 52.5 0.000 rs (Gm/H 3.32 0.83 2.17	1: Low 1: No 1: No 2: 59. 2: 11.5 LDGT 0.00 0.00 0.00 0.00	Ar Oper (F) Mi HDGV 52.5 0.000 8.16 1.27 6.42	Alti mbient rating l eriod 2 LDDV 52.5 0.000 0.31 0.31	tude: 1 Temp: 9 Node: 7 RVP: 1 LDDT 52.5 0.000 0.41 0.41	500. Ft. 75.0 / 0.0 / 1. (F) 1.5 Per- HDDV 52.5 0.130 1.20 1.20	75.0 / 0.0 / iod 2 1 MC 52.5 0.000 5.20 1.26 3.48	775.0 F 70.0 (r: 1988 All Veh 1.94 0.65 1.04
Cal. 52.5m Veh. VHT Compo Total Exhst Evap. Refue	Year: ph 75 Type: Spd.: Mix: site 1 HC: HC: HC: HC:	1992 Antr F 0%CS LDGV 52.5 0.870 Emission 2.05 0.57 1.20 0.00	I/M ti-tam. Miniu Peri LDGT1 52.5 0.000 52.5 0.000 2.19 0.64 1.29 0.00	Region Program Program mum Temp od 1 RVP LDGT2 52.5 0.000 rs (Gm/M 3.32 0.83 2.17 0.00	I: Low I: No I: No I: S9. I: 11.5 LDGT 0.00 0.00 0.00 0.00	Ar Oper (F) Hi HDGV 52.5 0.000 8.16 1.27 6.42 0.00	Alti mbient rating l eriod 2 LDDV 52.5 0.000 0.31 0.31	tude: 1 Temp: 4 Node: 7 Temp: 9 RVP: 1 LDDT 52.5 0.000 0.41 0.41	500. Ft. 75.0 / 0.0 / 1. (F) 1.5 Per HDDV 52.5 0.130 1.20 1.20	75.0 / 0.0 / MC 52.5 0.000 5.20 1.26 3.48	775.0 F 70.0 71: 1988 All Veh 1.94 0.65 1.04 0.00
Cal. 52.5m Veh. Veh. VMT Compo Total Exhst Evap. Refue Runin	Year: ph 75 Type: Spd.: Mix: site HC: HC: HC: HC: g HC:	1992 Ann F 0%CS LDGV 52.5 0.870 Emission 2.05 0.57 1.20 0.00 0.17	I/M ti-tam. Minii Peri LDGT1 52.5 0.000 Factor 2.19 0.64 1.29 0.00 0.16	Region Program Program mum Temp od 1 RVP LDGT2 52.5 0.000 rs (Gm/M 3.32 0.83 2.17 0.00 0.22	I: Low I: No I: No I: S9. I: 11.5 LDGT 0.00 0.00 0.00 0.00 0.00	Ar Oper (F) Ma P(HDGV 52.5 0.000 8.16 1.27 6.42 0.00 0.34	Alti mbient rating l eriod 2 LDDV 52.5 0.000 0.31 0.31	tude: 1 Temp: 4 Node: 7 Temp: 9 RVP: 1 LDDT 52.5 0.000 0.41 0.41	500. Ft. 75.0 / 0.0 / 1. (F) 1.5 Per HDDV 52.5 0.130 1.20 1.20	75.0 / 0.0 / MC 52.5 0.000 5.20 1.26 3.48	75.0 F 70.0 71.988 All Veh 1.94 0.65 1.04 0.00 0.14
Cal. 52.5m Veh. Veh. VMT Compo Total Exhst Evap. Refue Runin Rstin	Year: ph 75 Type: Spd.: Mix: Site I HC: HC: HC: g HC: g HC:	1992 An: F 0%CS LDGV 52.5 0.870 Emission 2.05 0.57 1.20 0.00 0.17 0.11	I/M ti-tam. Minii Peri LDGT1 52.5 0.000 Facto 2.19 0.64 1.29 0.00 0.16 0.09	Region Program Program Mum Temp od 1 RVP LDGT2 52.5 0.000 rs (Gm/H 3.32 0.83 2.17 0.00 0.22 0.10	1: Low 1: No 1: No 1: S9. 1: 11.5 LDGT 0.00 0.00 0.00 0.00 0.00 0.00 0.00	Ar Oper (F) Ma PGV 52.5 0.000 8.16 1.27 6.42 0.00 0.34 0.13	Alti mbient rating f eriod 2 LDDV 52.5 0.000 0.31 0.31	tude: 1 Temp: 9 RVP: 1 LDDT 52.5 0.000 0.41 0.41	500. Ft. 75.0 / 0.0 / 1. (F) 1.5 Per HDDV 52.5 0.130 1.20	75.0 / 0.0 / iod 2 1 MC 52.5 0.000 5.20 1.26 3.48 0.46	75.0 F 70.0 71.1988 All Veh 0.65 1.04 0.00 0.14 0.10
Cal. 52.5m Veh. Veh. VMT Compo Total Exhst Evap. Refue Refue Refue Rstin Exhst	Year: ph 75 Type: Spd.: Mix: site HC: HC: HC: G HC: g HC: CO:	1992 An: F 0%CS LDGV 52.5 0.870 Emission 2.05 0.57 1.20 0.00 0.17 0.11 8.14	I/M ti-tam. Peri LDGT1 52.5 0.000 Facto 2.19 0.64 1.29 0.06 0.16 0.09 0.00	Region Program Program Mum Temp od 1 RVP LDGT2 52.5 0.000 rs (Gm/H 3.32 0.83 2.17 0.00 0.22 0.10 0.00	I: Low I: No I: No I: S9. I: 11.5 LDGT 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.	Ar Oper (F) Ma Po HDGV 52.5 0.000 8.16 1.27 6.42 0.00 0.34 0.13 0.00	Alti mbient rating f eriod 2 LDDV 52.5 0.000 0.31 0.31 0.31	tude: 1 Temp: 9 RVP: 1 LDDT 52.5 0.000 0.41 0.41	500. Ft. 75.0 / 0.0 / 1. (F) 1.5 Per- HDDV 52.5 0.130 1.20 1.20 5.93	75.0 / 0.0 / iod 2 1 MC 52.5 0.000 5.20 1.26 3.48 0.46 0.00	75.0 F 70.0 71.988 All Veh 0.65 1.04 0.65 1.04 0.00 0.14 0.10 7.85
Cal. 52.5m Veh. Veh. VMT Compo Total Exhst Evap. Refue Refue Runin Rstin Exhst	Year: ph 75 Type: Spd.: Mix: site HC: HC: HC: g HC: g HC: CO: NOX:	1992 An: F 0%CS LDGV 52.5 0.870 Emission 2.05 0.57 1.20 0.00 0.17 0.11 8.14 0.90	I/M ti-tam. Peri LDGT1 52.5 0.000 Facto 2.19 0.64 1.29 0.64 1.29 0.64 1.29 0.00 0.16 0.00 0.00	Region Program Program Mum Temp od 1 RVP LDGT2 52.5 0.000 rs (Gm/H 3.32 0.83 2.17 0.00 0.22 0.10 0.00 0.00	I: Low I: No I: No I: S9. I: 11.5 LDGT 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.	Ar Oper (F) Ma Po HDGV 52.5 0.000 8.16 1.27 6.42 0.00 0.34 0.13 0.00 0.00	Alti mbient rating l eriod 2 LDDV 52.5 0.000 0.31 0.31 0.00 0.00	tude: Temp: 9 RVP: 1 LDDT 52.5 0.000 0.41 0.41 0.00 0.00	500. Ft. 75.0 / 0.0 / 1. (F) 1.5 Per- HDDV 52.5 0.130 1.20 1.20 5.93 17.59	75.0 / 0.0 / MC 52.5 0.000 5.20 1.26 3.48 0.46 0.00 0.00	75.0 F 70.0 71.988 All Veh 0.65 1.04 0.65 1.04 0.14 0.10 7.85 3.07
Cal. 52.5m Veh. Veh. VMT Compo Total Exhst Evap. Refue Runnn Rstin Exhst Hot S	Year: ph 75 Type: Spd.: Mix: Site I HC: HC: HC: G HC: SG HC: SG HC: NOX: tabil	1992 An: F 0%CS LDGV 52.5 0.870 2.05 0.57 1.20 0.05 0.17 0.11 8.14 0.90 ized Id	I/M ti-tam. Peri LDGT1 52.5 0.000 Facto 2.19 0.64 1.29 0.06 0.16 0.09 0.00 0.00 Le Emis	Region Program Program Mum Temp od 1 RVP LDGT2 52.5 0.000 rs (Gm/H 3.32 0.83 2.17 0.00 0.22 0.10 0.00 0.00 sion Fac	I: Low I: No I: No I: S9. I: 11.5 LDGT I: LDGT I: LDGT I: 0.00	Ar Oper (F) Ma Pd HDGV 52.5 0.000 8.16 1.27 6.42 0.00 0.34 0.34 0.34 0.34 0.00 0.00 Gm/Hr)	Alti mbient rating l eriod 2 LDDV 52.5 0.000 0.31 0.31 0.00 0.00	tude: Temp: 4ode: Temp: 9 RVP: 1 LDDT 52.5 0.000 0.41 0.41 0.00 0.00	500. Ft. 75.0 / 0.0 / 1. (F) 1.5 Per HDDV 52.5 0.130 1.20 1.20 5.93 17.59	75.0 / 0.0 / MC 52.5 0.000 5.20 1.26 3.48 0.46 0.00 0.00	75.0 F 70.0 71.988 All Veh 0.65 1.04 0.04 0.10 7.85 3.07
Cal. 52.5m Veh. Veh. VMT Compo Total Exhst Evap. Refue Runin Exhst Exhst Hot S Idle	Year: ph 75 Type: Spd.: Mix: site HC: HC: HC: g HC: g HC: NOX: tabil HC:	1992 An: F 0%CS 52.5 0.870 52.5 0.870 2.05 0.57 1.20 0.05 0.17 0.11 8.14 0.90 ized Id 24.27	I/M ti-tam. Peri LDGT1 52.5 0.000 n Facto 2.19 0.64 1.29 0.64 1.29 0.00 0.16 0.09 0.00 0.00 0.00 0.00 le Emis 0.00	Region Program Program Mum Temp od 1 RVP LDGT2 52.5 0.000 rs (Gm/H 3.32 0.83 2.17 0.00 0.22 0.10 0.22 0.10 0.00 sion Fac 0.00	I: Low I: No I: No I: S9. I: 11.5 LDGT I: LDGT I: LDGT I: 0.00	Ar Oper (F) Ma Pd HDGV 52.5 0.000 8.16 1.27 6.42 0.00 0.34 0.34 0.34 0.30 0.34 0.30 0.00 Gm/Hr) 0.00	Alti mbient rating l eriod 2 LDDV 52.5 0.000 0.31 0.31 0.00 0.00 0.00	tude: femp: Mode: Temp: 9 RVP: 1 LDDT 52.5 0.000 0.41 0.41 0.41 0.00 0.00 0.00	500. Ft. 75.0 / 0.0 / 1. (F) 1.5 Per HDDV 52.5 0.130 1.20 1.20 5.93 17.59 17.37	75.0 / 0.0 / MC 52.5 0.000 5.20 1.26 3.48 0.46 0.00 0.00	75.0 F 70.0 71: 1988 All Veh 0.65 1.04 0.06 1.14 0.10 7.85 3.07 23.37
Cal. 52.5m Veh. Veh. VMT Compo Total Exhst Evap. Refue Runin Rstin Exhst Hot S Idle Idle	Year: ph 75 Type: Spd.: Mix: Site 1 HC: HC: U HC: G HC: NOX: tabil HC: CO:	1992 Ann F 0XCS 52.5 0.870 52.5 0.870 2.05 0.57 1.20 0.00 0.17 0.11 8.14 0.90 ized Id 24.27 293.10	I/M ti-tam. Minin Peri LDGT1 52.5 0.000 n Facto 2.19 0.64 1.29 0.64 1.29 0.64 1.29 0.00 0.16 0.00 0.00 0.00 le Emis: 0.000 0.00	Region Program Program Mum Temp od 1 RVP LDGT2 52.5 0.000 rs (Gm/H 3.32 0.83 2.17 0.00 0.22 0.10 0.00 0.00 sion Fac 0.00 0.00	1: Low 1: No 1: No 1: S9. 1: 11.5 LDGT 1: LDGT 0.00	Ar Oper (F) Ma Pd HDGV 52.5 0.000 8.16 1.27 6.42 0.00 0.34 0.34 0.34 0.00 0.00 Gm/Hr) 0.00 0.00	Alti mbient rating l eriod 2 LDDV 52.5 0.000 0.31 0.31 0.00 0.00 0.00 0.00	tude: femp: fode: femp: 9 RVP: 1 LDDT 52.5 0.000 0.41 0.41 0.41 0.00 0.00 0.00 0.0	500. Ft. 75.0 / 0.0 / 1. (F) 1.5 Per HDDV 52.5 0.130 1.20 1.20 5.93 17.59 17.37 51.18	75.0 / 0.0 / iod 2) MC 52.5 0.000 5.20 1.26 3.48 0.46 0.00 0.00 0.00	75.0 F 70.0 71: 1988 All Veh 0.65 1.04 0.00 0.14 0.00 7.85 3.07 23.37 261.65
Cal. 52.5m Veh. Veh. VMT Compo Total Exhst Evap. Refue Runin Rstin Exhst Hot S Idle Idle	Year: ph 75 Type: Spd.: Mix: Site 1 HC: HC: Q HC: Q HC: Q HC: NOX: tabil HC: NOX:	1992 An: F 0%CS 52.5 0.870 52.5 0.57 1.20 0.07 0.17 8.14 0.90 ized Id 24.27 293.10 2.90	I/M ti-tam. Minin Peri LDGT1 52.5 0.000 Facto 2.19 0.64 1.29 0.64 1.29 0.00 0.16 0.00 0.00 0.00 0.00 0.00 0.00	Region Program Program Mum Temp od 1 RVP LDGT2 52.5 0.000 rs (Gm/H 3.32 0.83 2.17 0.00 0.22 0.10 0.20 0.00 0.00 sion Fac 0.00 0.00 0.00	1: Low 1: No 1: No 1: S9. 1: 11.5 LDGT 1: LDGT 1: LDGT 0.00 0.0	Ar Oper (F) Ma Pd HDGV 52.5 0.000 8.16 1.27 6.42 0.00 0.34 0.00 0.34 0.00 0.00 Gm/Hr) 0.00 0.00 0.00	Alti mbient rating l eriod 2 LDDV 52.5 0.000 0.31 0.31 0.00 0.00 0.00 0.00 0.0	tude: femp: femp: 9 RVP: 1 LDDT 52.5 0.000 0.41 0.41 0.00 0.00 0.00 0.00 0.00 0.00	500. Ft. 75.0 / 0.0 / 1. (F) 1.5 Per HDDV 52.5 0.130 1.20 1.20 1.20 5.93 17.59 17.37 51.18 22.32	75.0 / 0.0 / iod 2) MC 52.5 0.000 5.20 1.26 3.48 0.46 0.00 0.00 0.00 0.00	75.0 F 70.0 71: 1988 All Veh 0.65 1.04 0.00 0.14 0.10 7.85 3.07 23.37 261.65 5.43

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Cal. Year: 1992		Region	LOW		Alti	tude:	500. Ft.		
	I/M	Program	: No	Ar	mbient	Temp:	75.0 /	75.0 /	75.0 F
An	ti-tam.	Program	NO	Oper	rating	lode:	0.0 /	0.0 /	0.0
55.0mph 75F 0%CS									
5510mpri 151 0/000	Mini	num Temo	: 59.	(F) Ma	aximum 1	Temp: 9	1. (F)		
	Peri	od 1 RVP	: 11.5	Pe	eriod 2	RVP: 1	1.5 Peri	iod 2 Y	r: 1988
Veh. Type: LDGV	LDGT1	LDGT2	LDGT	HDGV	LDDV	LDDT	HDDV	MC	All Veh
Veh. Spd.: 55.0	55.0	55.0		55.0	55.0	55.0	55.0	55.0	0411-14-14-14-14-14-14-14-14-14-14-14-14-
VMT Mix: 0.870	0.000	0.000		0.000	0.000	0.000	0.130	0.000	
Composite Emissio	n Facto	rs (Gm/M	lile)						
Total HC: 2.08	2.23	3.37	0.00	8.11	0.30	0.41	1.17	5.31	1.96
Exhst HC: 0.62	0.69	0.90	0.00	1.25	0.30	0.41	1.17	1.36	0.69
Evap. HC: 1.20	1.29	2.17	0.00	6.42				3.48	1.04
Refuel HC: 0.00	0.00	0.00	0.00	0.00					0.00
Runing HC: 0.15	0.15	0.20	0.00	0.31					0.13
Rsting HC: 0.11	0.09	0.10	0.00	0.13				0.46	0,10
Exhst CO: 10.03	0.00	0.00	0.00	0.00	0.00	0.00	6.08	0.00	9.52
Exhst NOX: 0.98	0.00	0.00	0.00	0.00	0.00	0.00	18.88	0.00	3.31
Hot Stabilized Id	le Emis	sion Fac	tors (Gm/Hr)					
Idle HC: 24.27	0.00	0.00	0.00	0.00	0.00	0.00	17.37	0.00	23.37
Idle CO:293.10	0.00	0.00	0.00	0.00	0.00	0.00	51.18	0.00	261.65
Idle NOX: 2.90	0.00	0.00	0.00	0.00	0,00	0.00	22.32	0.00	5.43
Cal. Year: 1992		Region	1: Low		Alti	tude:	500. Ft.		
Cal. Year: 1992	I/M	Region Program	n: Low n: No	A	Alti mbient	tude: Temp:	500. Ft. 75.0 /	75.0 /	75.0 F
Cal. Year: 1992	I/M ti-tam.	Region Program Program	n: Low n: No n: No	Ai Ope	Alti mbient rating	tude: Temp: Mode:	500. Ft 75.0 / 0.0 /	, 75.0 / 0.0 /	75.0 F
Cal. Year: 1992 An 57.5mph 75F 0%CS	I/M ti-tam.	Regior Program Program	n: Low n: No n: No	Ai Ope	Alti mbient rating	tude: Temp: Mode:	500. Ft. 75.0 / 0.0 /	75.0 / 0.0 /	75.0 F
Cal. Year: 1992 An 57.5mph 75F 0%CS	I/M ti-tam. Mini	Region Program Program mum Temp	n: Low n: No n: No p: 59.	Ai Ope (F) M	Alti mbient rating aximum	tude: Temp: Mode: Temp: 9	500. Ft 75.0 / 0.0 / 1. (F)	75.0 / 0.0 /	75.0 F
Cal. Year: 1992 An 57.5mph 75F 0%CS	I/M ti-tam. Mini Peri	Region Program Program mum Temp od 1 RVF	n: Low n: No n: No p: 59. P: 11.5	Ai Ope (F) Mi P	Alti mbient rating aximum eriod 2	tude: Temp: Mode: Temp: 9 RVP: 1	500. Ft 75.0 / 0.0 / 1. (F) 1.5 Per	75.0 / 0.0 /	75.0 F 0.0
Cal. Year: 1992 An 57.5mph 75F 0%CS Veh. Type: LDGV	I/M ti-tam. Mini Peri LDGT1	Regior Program Program mum Temp od 1 RVF LDGT2	n: Low n: No n: No o: 59. 2: 11.5 LDGT	Ai Ope (F) M P HDGV	Alti mbient rating aximum eriod 2 LDDV	tude: Temp: Mode: Temp: 9 RVP: 1 LDDT	500. Ft. 75.0 / 0.0 / 1. (F) 1.5 Per HDDV	75.0 / 0.0 / iod 2 Y MC	75.0 F 0.0 7: 1988 All Veh
Cal. Year: 1992 An 57.5mph 75F 0%CS Veh. Type: LDGV Veh. Spd.: 57.5	I/M ti-tam. Mini Peri LDGT1 57.5	Region Program Program mum Temp od 1 RVF LDGT2 57.5	n: Low n: No n: No o: 59. 2: 11.5 LDGT	Ar Ope (F) M HDGV 57.5	Alti mbient rating aximum eriod 2 LDDV 57.5	tude: Temp: Mode: Temp: 9 RVP: 1 LDDT	500. Ft 75.0 / 0.0 / 1. (F) 1.5 Per HDDV	75.0 / 0.0 / iod 2 Y MC 57.5	75.0 F 0.0 7: 1988 All Veh
Cal. Year: 1992 An 57.5mph 75F 0%CS Veh. Type: LDGV Veh. Spd.: 57.5 VMT Mix: 0.870	I/M ti-tam. Mini Peri LDGT1 57.5 0.000	Region Program Program mum Temp od 1 RVF LDGT2 57.5 0.000	n: Low n: No n: No p: 59. p: 11.5 LDGT	Ar Ope (F) M HDGV 57.5 0.000	Alti mbient rating aximum eriod 2 LDDV 57.5 0.000	tude: Temp: Mode: Temp: 9 RVP: 1 LDDT 57.5 0.000	500. Ft 75.0 / 0.0 / 1. (F) 1.5 Per HDDV 57.5 0.130	75.0 / 0.0 / iod 2 Y MC 57.5 0.000	75.0 F 0.0 7: 1988 All Veh
Cal. Year: 1992 An 57.5mph 75F 0%CS Veh. Type: LDGV Veh. Spd.: 57.5 VMT Mix: 0.870 Composite Emissio	I/M ti-tam. Mini Peri LDGT1 57.5 0.000 n Facto	Regior Program Program od 1 RVF LDGT2 57.5 0.000 rs (Gm/H	n: Low n: No n: No p: 59. p: 11.5 LDGT nile)	Ai Ope (F) Mi P HDGV 57.5 0.000	Alti mbient rating aximum eriod 2 LDDV 57.5 0.000	tude: Temp: Mode: Temp: 9 RVP: 1 LDDT 57.5 0.000	500. Ft 75.0 / 0.0 / 1. (F) 1.5 Per HDDV 57.5 0.130	75.0 / 0.0 / iod 2 Y MC 57.5 0.000	75.0 F 0.0 7: 1988 All Veh
Cal. Year: 1992 An 57.5mph 75F 0%CS Veh. Type: LDGV Veh. Spd.: 57.5 VMT Mix: 0.870 Composite Emissio Total HC: 2.12	I/M ti-tam. Peri LDGT1 57.5 0.000 n Facto 2.27	Regior Program Program od 1 RVF LDGT2 57.5 0.000 rs (Gm/H 3.43	n: Low n: No n: No p: 59. p: 11.5 LDGT (ile) 0.00	Ai Ope (F) Mi HDGV 57.5 0.000 8.07	Alti mbient rating aximum eriod 2 LDDV 57.5 0.000 0.30	tude: 1 Temp: 9 RVP: 1 LDDT 57.5 0.000 0.40	500. Ft. 75.0 / 0.0 / 1. (F) 1.5 Per HDDV 57.5 0.130 1.16	75.0 / 0.0 / iod 2 Y MC 57.5 0.000 5.41	75.0 F 0.0 7: 1988 All Veh
Cal. Year: 1992 An 57.5mph 75F 0%CS Veh. Type: LDGV Veh. Spd.: 57.5 VMT Mix: 0.870 Composite Emissio Total HC: 2.12 Exhst HC: 0.67	I/M ti-tam. Minin Peri LDGT1 57.5 0.000 n Facto 2.27 0.75	Region Program Program mum Temp od 1 RVF LDGT2 57.5 0.000 rs (Gm/H 3.43 0.97	n: Low n: No n: No p: 59. 2: 11.5 LDGT nile) 0.00 0.00	Ar Ope (F) M HDGV 57.5 0.000 8.07 1.24	Alti mbient rating aximum eriod 2 LDDV 57.5 0.000 0.30 0.30	tude: Temp: Mode: Temp: 9 RVP: 1 LDDT 57.5 0.000 0.40 0.40	500. Ft. 75.0 / 0.0 / 1. (F) 1.5 Per HDDV 57.5 0.130 1.16 1.16	75.0 / 0.0 / iod 2 Y MC 57.5 0.000 5.41 1.47	75.0 F 0.0 7r: 1988 All Veh
Cal. Year: 1992 An 57.5mph 75F 0%CS Veh. Type: LDGV Veh. Spd.: 57.5 VMT Mix: 0.870 Composite Emissio Total HC: 2.12 Exhst HC: 0.67 Evap. HC: 1.20	I/M ti-tam. Minin Peri LDGT1 57.5 0.000 n Facto 2.27 0.75 1.29	Region Program Program mum Temp od 1 RVF LDGT2 57.5 0.000 rs (Gm/H 3.43 0.97 2.17	1: Low 1: No 1: No 1: 59. 1: 59. 1: 11.5 LDGT 1: LDGT 0.00 0.00 0.00	Ar Ope (F) M HDGV 57.5 0.000 8.07 1.24 6.42	Alti mbient rating aximum eriod 2 LDDV 57.5 0.000 0.30 0.30	tude: Temp: Mode: Temp: 9 RVP: 1 LDDT 57.5 0.000 0.40 0.40	500. Ft. 75.0 / 0.0 / 1. (F) 1.5 Per HDDV 57.5 0.130 1.16 1.16	75.0 / 0.0 / iod 2 Y MC 57.5 0.000 5.41 1.47 3.48	75.0 F 0.0 7r: 1988 All Veh 1.99 0.73 1.04
Cal. Year: 1992 An 57.5mph 75F 0%CS Veh. Type: LDGV Veh. Spd.: 57.5 VMT Mix: 0.870 Composite Emissio Total HC: 2.12 Exhst HC: 0.67 Evap. HC: 1.20 Refuel HC: 0.00	I/M ti-tam. Minin Peri LDGT1 57.5 0.000 n Facto 2.27 0.75 1.29 0.00	Regior Program Program mum Temp od 1 RVF LDGT2 57.5 0.000 rs (Gm/H 3.43 0.97 2.17 0.00	1: Low 1: No 1: No 1: 59. 1: 11.5 LDGT 1: LDGT 0.00 0.00 0.00 0.00	Ar Ope (F) M HDGV 57.5 0.000 8.07 1.24 6.42 0.00	Alti mbient rating aximum eriod 2 LDDV 57.5 0.000 0.30 0.30	tude: Temp: Mode: Temp: 9 RVP: 1 LDDT 57.5 0.000 0.40 0.40	500. Ft. 75.0 / 0.0 / 1. (F) 1.5 Per HDDV 57.5 0.130 1.16 1.16	75.0 / 0.0 / iod 2 Y MC 57.5 0.000 5.41 1.47 3.48	75.0 F 0.0 7r: 1988 All Veh 1.99 0.73 1.04 0.00
Cal. Year: 1992 An 57.5mph 75F 0%CS Veh. Type: LDGV Veh. Spd.: 57.5 VMT Mix: 0.870 Composite Emissio Total HC: 2.12 Exhst HC: 0.67 Evap. HC: 1.20 Refuel HC: 0.00 Runing HC: 0.14	I/M ti-tam. Minin Peri LDGT1 57.5 0.000 n Facto 2.27 0.75 1.29 0.00 0.14	Regior Program Program mum Temp od 1 RVF LDGT2 57.5 0.000 rs (Gm/H 3.43 0.97 2.17 0.00 0.18	1: Low 1: No 1: No 1: 59. 1: 11.5 LDGT 1: LDGT 0.00 0.00 0.00 0.00 0.00	Ar Ope (F) M. P HDGV 57.5 0.000 8.07 1.24 6.42 0.00 0.29	Alti mbient rating eriod 2 LDDV 57.5 0.000 0.30 0.30	tude: Temp: Mode: Temp: 9 RVP: 1 LDDT 57.5 0.000 0.40 0.40	500. Ft. 75.0 / 0.0 / 1. (F) 1.5 Per HDDV 57.5 0.130 1.16 1.16	75.0 / 0.0 / iod 2 Y MC 57.5 0.000 5.41 1.47 3.48	75.0 F 0.0 7r: 1988 All Veh 1.99 0.73 1.04 0.00 0.12
Cal. Year: 1992 An 57.5mph 75F 0%CS Veh. Type: LDGV Veh. Spd.: 57.5 VMT Mix: 0.870 Composite Emissio Total HC: 2.12 Exhst HC: 0.67 Evap. HC: 1.20 Refuel HC: 0.00 Runing HC: 0.14 Rsting HC: 0.11	I/M ti-tam. Mini Peri LDGT1 57.5 0.000 n Facto 2.27 0.75 1.29 0.00 0.14 0.09	Regior Program Program mum Temp od 1 RVF LDGT2 57.5 0.000 rs (Gm/H 3.43 0.97 2.17 0.00 0.18 0.10	1: Low 1: No 1: No 1: 59. 1: 11.5 LDGT 0.00 0.00 0.00 0.00 0.00 0.00	Ar Ope (F) M. P HDGV 57.5 0.000 8.07 1.24 6.42 0.00 0.29 0.13	Alti mbient rating eriod 2 LDDV 57.5 0.000 0.30 0.30	tude: 1 Temp: Mode: Temp: 9 RVP: 1 LDDT 57.5 0.000 0.40 0.40	500. Ft. 75.0 / 0.0 / 1. (F) 1.5 Per HDDV 57.5 0.130 1.16 1.16	75.0 / 0.0 / iod 2 Y MC 57.5 0.000 5.41 1.47 3.48 0.46	75.0 F 0.0 7r: 1988 All Veh 1.99 0.73 1.04 0.00 0.12 0.10
Cal. Year: 1992 An 57.5mph 75F 0%CS Veh. Type: LDGV Veh. Spd.: 57.5 VMT Mix: 0.870 Composite Emissio Total HC: 2.12 Exhst HC: 0.67 Evap. HC: 1.20 Refuel HC: 0.00 Runing HC: 0.14 Rsting HC: 0.11 Exhst CO: 11.92	I/M ti-tam. Minip Peri LDGT1 57.5 0.000 n Facto 2.27 0.75 1.29 0.00 0.14 0.09 0.00	Region Program Program mum Temp od 1 RVF LDGT2 57.5 0.000 rs (Gm/H 3.43 0.97 2.17 0.00 0.18 0.10 0.00	1: Low 1: No 1: No 1: 59. 1: 11.5 LDGT 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00	Ar Ope (F) M. PHDGV 57.5 0.000 8.07 1.24 6.42 0.00 0.29 0.13 0.00	Alti mbient rating eriod 2 LDDV 57.5 0.000 0.30 0.30 0.30	tude: 1 Temp: Mode: Temp: 9 RVP: 1 LDDT 57.5 0.000 0.40 0.40	500. Ft. 75.0 / 0.0 / 1. (F) 1.5 Per HDDV 57.5 0.130 1.16 1.16 1.16	75.0 / 0.0 / iod 2 Y MC 57.5 0.000 5.41 1.47 3.48 0.46 0.00	75.0 F 0.0 7r: 1988 All Veh 1.99 0.73 1.04 0.00 0.12 0.10 11.19
Cal. Year: 1992 An 57.5mph 75F 0%CS Veh. Type: LDGV Veh. Spd.: 57.5 VMT Mix: 0.870 Composite Emissio Total HC: 2.12 Exhst HC: 0.67 Evap. HC: 1.20 Refuel HC: 0.00 Runing HC: 0.14 Rsting HC: 0.11 Exhst CO: 11.92 Exhst NOX: 1.06	I/M ti-tam. Minip Peri LDGT1 57.5 0.000 n Facto 2.27 0.75 1.29 0.00 0.14 0.09 0.00 0.00	Region Program Program mum Temp od 1 RVF LDGT2 57.5 0.000 rs (Gm/H 3.43 0.97 2.17 0.00 0.18 0.10 0.00 0.00	1: Low 1: No 1: No 5: 59. 2: 11.5 LDGT 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00	Au Ope (F) Mi P HDGV 57.5 0.000 8.07 1.24 6.42 0.00 0.29 0.13 0.00 0.00	Alti mbient rating eriod 2 LDDV 57.5 0.000 0.30 0.30 0.30 0.00 0.00	tude: 1 Temp: Mode: Temp: 9 RVP: 1 LDDT 57.5 0.000 0.40 0.40 0.40	500. Ft. 75.0 / 0.0 / 1. (F) 1.5 Per HDDV 57.5 0.130 1.16 1.16 1.16 6.30 20.44	75.0 / 0.0 / iod 2 Y MC 57.5 0.000 5.41 1.47 3.48 0.46 0.00 0.00	75.0 F 0.0 7r: 1988 All Veh 1.99 0.73 1.04 0.00 0.12 0.10 11.19 3.58
Cal. Year: 1992 An 57.5mph 75F 0%CS Veh. Type: LDGV Veh. Spd.: 57.5 VMT Mix: 0.870 Composite Emissio Total HC: 2.12 Exhst HC: 0.67 Evap. HC: 1.20 Refuel HC: 0.014 Rsting HC: 0.11 Exhst CO: 11.92 Exhst NOX: 1.06 Hot Stabilized Id	I/M ti-tam. Mini Peri LDGT1 57.5 0.000 n Facto 2.27 0.75 1.29 0.00 0.14 0.09 0.00 0.00 0.00 0.00	Region Program Program mum Temp od 1 RVF LDGT2 57.5 0.000 rs (Gm/P 3.43 0.97 2.17 0.00 0.18 0.10 0.00 0.00 sion Fac	1: Low 1: No 1: No 1: S9. 2: 59. 2: 11.5 LDGT 0.00 0	Au Ope (F) Mi P, HDGV 57.5 0.000 8.07 1.24 6.42 0.00 0.29 0.13 0.00 0.00 Gm/Hr)	Alti mbient rating aximum eriod 2 LDDV 57.5 0.000 0.30 0.30 0.30 0.00	tude: Temp: Mode: Temp: 9 RVP: 1 LDDT 57.5 0.000 0.40 0.40 0.40	500. Ft. 75.0 / 0.0 / 1. (F) 1.5 Per HDDV 57.5 0.130 1.16 1.16 1.16 6.30 20.44	75.0 / 0.0 / MC 57.5 0.000 5.41 1.47 3.48 0.46 0.00 0.00	75.0 F 0.0 7: 1988 All Veh 0.73 1.04 0.00 0.12 0.10 11.19 3.58
Cal. Year: 1992 An 57.5mph 75F 0%CS Veh. Type: LDGV Veh. Spd.: 57.5 VMT Mix: 0.870 Composite Emissio Total HC: 2.12 Exhst HC: 0.67 Evap. HC: 1.20 Refuel HC: 0.01 Runing HC: 0.14 Rsting HC: 0.11 Exhst CO: 11.92 Exhst NOX: 1.06 Hot Stabilized Id Idle HC: 24.27	I/M ti-tam. Mini Peri LDGT1 57.5 0.000 n Facto 2.27 0.75 1.29 0.00 0.14 0.09 0.00 0.00 0.00 le Emis 0.00	Regior Program Program mum Temp od 1 RVF LDGT2 57.5 0.000 rs (Gm/H 3.43 0.97 2.17 0.00 0.18 0.10 0.18 0.00 0.00 sion Fac 0.00	1: Low 1: No 1: No 1: S9. 2: 59. 2: 11.5 LDGT 0.00 0	Au Ope (F) Mi HDGV 57.5 0.000 8.07 1.24 6.42 0.00 0.29 0.13 0.00 0.00 Gm/Hr) 0.00	Alti mbient rating aximum eriod 2 LDDV 57.5 0.000 0.30 0.30 0.30 0.00 0.00 0.00	tude: Temp: Mode: Temp: 9 RVP: 1 LDDT 57.5 0.000 0.40 0.40 0.40 0.00 0.00	500. Ft. 75.0 / 0.0 / 1. (F) 1.5 Per HDDV 57.5 0.130 1.16 1.16 1.16 0.30 20.44 17.37	75.0 / 0.0 / MC 57.5 0.000 5.41 1.47 3.48 0.46 0.00 0.00	75.0 F 0.0 7: 1988 All Veh 1.99 0.73 1.04 0.00 0.12 0.10 11.19 3.58 23.37
Cal. Year: 1992 An 57.5mph 75F 0%CS Veh. Type: LDGV Veh. Spd.: 57.5 VMT Mix: 0.870 Composite Emissio Total HC: 2.12 Exhst HC: 0.67 Evap. HC: 1.20 Refuel HC: 0.04 Rsting HC: 0.14 Rsting HC: 0.11 Exhst CO: 11.92 Exhst NOX: 1.06 Hot Stabilized Id Idle HC: 24.27 Idle CO:293.10	I/M ti-tam. Mini Peri LDGT1 57.5 0.000 n Facto 2.27 0.75 1.29 0.00 0.14 0.09 0.00 0.00 le Emis 0.00 0.00	Regior Program Program mum Temp od 1 RVF LDGT2 57.5 0.000 rs (Gm/H 3.43 0.97 2.17 0.00 0.18 0.10 0.00 sion Fac 0.00 0.00	1: Low 1: No 1: No 1: S9. 1: 59. 1: 1.5 LDGT 0.00 0.	Au Ope (F) M HDGV 57.5 0.000 8.07 1.24 6.42 0.00 0.29 0.13 0.00 0.00 Gm/Hr) 0.00 0.00	Alti mbient rating aximum eriod 2 LDDV 57.5 0.000 0.30 0.30 0.30 0.00 0.00 0.00	tude: Temp: Mode: Temp: 9 RVP: 1 LDDT 57.5 0.000 0.40 0.40 0.40 0.00 0.00 0.00	500. Ft. 75.0 / 0.0 / 1. (F) 1.5 Per HDDV 57.5 0.130 1.16 1.16 1.16 20.44 17.37 51.18	75.0 / 0.0 / MC 57.5 0.000 5.41 1.47 3.48 0.46 0.00 0.00 0.00	75.0 F 0.0 7: 1988 All Veh 1.99 0.73 1.04 0.00 0.12 0.10 11.19 3.58 23.37 261.65
Cal. Year: 1992 An 57.5mph 75F 0%CS Veh. Type: LDGV Veh. Spd.: 57.5 VMT Mix: 0.870 Composite Emissio Total HC: 2.12 Exhst HC: 0.67 Evap. HC: 1.20 Refuel HC: 0.04 Rsting HC: 0.14 Rsting HC: 0.11 Exhst CO: 11.92 Exhst NOX: 1.06 Hot Stabilized Id Idle HC: 24.27 Idle CO:293.10 Idle NOX: 2.90	I/M ti-tam. Mini Peri LDGT1 57.5 0.000 n Facto 2.27 0.75 1.29 0.00 0.14 0.09 0.00 0.00 le Emis 0.00 0.00 0.00	Regior Program Program mum Temp od 1 RVF LDGT2 57.5 0.000 rs (Gm/H 3.43 0.97 2.17 0.00 0.18 0.10 0.00 0.00 sion Fac 0.00 0.00 0.00	1: Low 1: No 1: No 1: S9. 1: S9.	Au Ope (F) M HDGV 57.5 0.000 8.07 1.24 6.42 0.00 0.29 0.13 0.00 0.00 Gm/Hr) 0.00 0.00	Alti mbient rating aximum eriod 2 LDDV 57.5 0.000 0.30 0.30 0.30 0.00 0.00 0.00 0	tude: Temp: Mode: Temp: 9 RVP: 1 LDDT 57.5 0.000 0.40 0.40 0.40 0.00 0.00 0.00 0	500. Ft. 75.0 / 0.0 / 1. (F) 1.5 Per HDDV 57.5 0.130 1.16 1.16 1.16 20.44 17.37 51.18 22.32	75.0 / 0.0 / MC 57.5 0.000 5.41 1.47 3.48 0.46 0.00 0.00 0.00 0.00 0.00	75.0 F 0.0 7r: 1988 All Veh 1.99 0.73 1.04 0.00 0.12 0.10 11.19 3.58 23.37 261.65 5.43

A second distance of the second distance of t										
Cal. Year:	1992		Region	: Low		Alti	tude: 5	500. Ft.	u Sila	
		1/M	Program	: No	An	nbient	[emp:	75.0 /	75.0 /	75.0 F
	Ant	i-tam.	Program	: No	Oper	rating	lode:	0.0 /	0.0 /	0.0
60.0mph 758	0%CS									
		Minir	num Temp	: 59.	(F) Ma	aximum 1	Temp: 9	l. (F)		
		Perio	od 1 RVP	: 11.5	Pe	eriod 2	RVP: 1	.5 Peri	od 2 Y	r: 1988
Veh. Type:	LDGV	LDGT1	LDGT2	LDGT	HDGV	LDDV	LDDT	HDDV	MC	All Veh
Veh. Spd.:	60.0	60.0	60.0		60.0	60.0	60.0	60.0	60.0	
VMT Mix:	0.870	0.000	0.000		0.000	0.000	0.000	0.130	0.000	
Composite E	mission	n Facto	rs (Gm/M	ile)						
Total HC:	2.15	2.31	3.48	0.00	8.05	0.30	0.40	1.15	5.52	2.02
Exhst HC:	0.72	0.80	1.05	0.00	1.24	0.30	0.40	1.15	1.58	0.77
Evap. HC:	1.20	1.29	2.17	0.00	6.42				3.48	1.04
Refuel HC:	0.00	0.00	0.00	0.00	0.00					0.00
Runing HC:	0.13	0.13	0.17	0.00	0.26					0.11
Rsting HC:	0.11	0.09	0.10	0.00	0.13				0.46	0.10
Exhst CO:	13.81	0.00	0.00	0.00	0.00	0.00	0.00	6.60	0.00	12.88
Exhst NOX:	1.13	0.00	0.00	0.00	0.00	0.00	0.00	22.34	0.00	3.89
Hot Stabili	ized Id	e Emis	sion Fac	tors (Gm/Hr)					
Idle HC:	24.27	0.00	0.00	0.00	0.00	0.00	0.00	17.37	0.00	23.37
Idle CO:2	293.10	0.00	0.00	0.00	0.00	0.00	0.00	51.18	0.00	261.65
Idle NOX:	2.90	0.00	0.00	0.00	0.00	0.00	0.00	22.32	0.00	5.43
the same of the local data and the same of the										
Cal. Year:	1992		Region	: Low		Alti	tude:	500. Ft.	, .	
Cal. Year:	1992	I/M	Region Program	1: Low	A	Alti mbient	tude: ! Temp:	500. Ft. 75.0 /	75.0 /	75.0 F
Cal. Year:	1992 Ani	I/M ti-tam.	Region Program Program	n: Low n: No n: No	Ar Oper	Alti mbient rating	tude: ! Temp: Mode:	500. Ft 75.0 / 0.0 /	75.0 / 0.0 /	75.0 F 0.0
Cal. Year: 62.5mph 751	1992 Ani 5 0%CS	I/M ti-tam.	Region Program Program	n: Low n: No n: No	Ar Oper	Alti mbient rating	tude: ! Temp: Mode:	500. Ft 75.0 / 0.0 /	75.0 / 0.0 /	75.0 F 0.0
Cal. Year: 62.5mph 751	1992 An F 0%CS	I/M ti-tam. Miniu	Region Program Program mum Temp	a: Low a: No a: No a: S9.	Ar Oper (F) Ma	Alti mbient rating f aximum	tude: ! Temp: Mode: Temp: 9	500. Ft 75.0 / 0.0 / 1. (F)	75.0 / 0.0 /	75.0 F 0.0
Cal. Year: 62.5mph 751	1992 An 0%CS	I/M ti-tam. Minii Perii	Region Program Program mum Temp od 1 RVP	n: Low n: No n: No p: 59. p: 11.5	Ar Oper (F) Ma Po	Alti mbient rating aximum eriod 2	tude: ! Temp: Mode: Temp: 9 RVP: 1	500. Ft 75.0 / 0.0 / 1. (F) 1.5 Per	75.0 / 0.0 /	75.0 F 0.0 r: 1988
Cal. Year: 62.5mph 751 Veh. Type:	1992 Ant 0%CS LDGV	I/M ti-tam. Minii Perii LDGT1	Region Program Program mum Temp od 1 RVP LDGT2	1: Low 1: No 1: No 0: 59. 2: 11.5 LDGT	Ar Oper (F) Ma Po HDGV	Alti mbient rating aximum eriod 2 LDDV	tude: Temp: Mode: Temp: 9 RVP: 1 LDDT	500. Ft 75.0 / 0.0 / 1. (F) 1.5 Per HDDV	75.0 / 0.0 / iod 2 Y MC	75.0 F 0.0 r: 1988 All Veh
Cal. Year: 62.5mph 751 Veh. Type:	1992 An 0%CS LDGV	I/M ti-tam. Minic Peric LDGT1	Region Program Program mum Temp od 1 RVP LDGT2	1: Low 1: No 1: No 2: 59. 2: 11.5 LDGT	Ar Oper (F) Ma Pr HDGV	Alti mbient rating aximum eriod 2 LDDV	tude: Temp: Mode: Temp: 9 RVP: 1 LDDT	500. Ft 75.0 / 0.0 / 1. (F) 1.5 Per HDDV	75.0 / 0.0 / iod 2 Y MC	75.0 F 0.0 r: 1988 All Veh
Cal. Year: 62.5mph 751 Veh. Type: Veh. Spd.:	1992 An: 0%CS LDGV 62.5	I/M ti-tam. Minin Perin LDGT1 62.5	Region Program Program mum Temp od 1 RVP LDGT2 62.5	1: Low 1: No 1: No 2: 59. 2: 11.5 LDGT	Ar Oper (F) Ma Pr HDGV	Alti mbient rating f aximum eriod 2 LDDV 62.5	tude: 1 Temp: Mode: Temp: 9 RVP: 1 LDDT	500. Ft 75.0 / 0.0 / 1. (F) 1.5 Per HDDV 62.5	75.0 / 0.0 / iod 2 Y MC 62.5	75.0 F 0.0 r: 1988 All Veh
Cal. Year: 62.5mph 751 Veh. Type: Veh. Spd.: VMT Mix:	1992 An 0XCS LDGV 62.5 0.870	I/M ti-tam. Minin Perio LDGT1 62.5 0.000	Region Program Program mum Temp od 1 RVP LDGT2 62.5 0.000	h: Low h: No h: No h: 59. h: 11.5 LDGT	Ar Oper (F) Mr HDGV 62.5 0.000	Alti mbient rating 1 aximum eriod 2 LDDV 62.5 0.000	tude: 1 Temp: Mode: Temp: 9 RVP: 1 LDDT 62.5 0.000	500. Ft 75.0 / 0.0 / 1. (F) 1.5 Per HDDV 62.5 0.130	75.0 / 0.0 / iod 2 Y MC 62.5 0.000	75.0 F 0.0 r: 1988 All Veh
Cal. Year: 62.5mph 751 Veh. Type: Veh. Spd.: VMT Mix: Composite B	1992 Ant 0%CS LDGV 62.5 0.870 Emissio	I/M ti-tam. Minin Perio LDGT1 62.5 0.000 n Facto	Region Program Program mum Temp od 1 RVP LDGT2 62.5 0.000 rs (Gm/M	n: Low n: No n: No p: 59. p: 11.5 LDGT	Ar Oper (F) Ma Pr HDGV 62.5 0.000	Alti mbient rating f eriod 2 LDDV 62.5 0.000	tude: 1 Temp: Mode: Temp: 9 RVP: 1 LDDT 62.5 0.000	500. Ft. 75.0 / 0.0 / 1. (F) 1.5 Per HDDV 62.5 0.130	75.0 / 0.0 / iod 2 Y MC 62.5 0.000	75.0 F 0.0 r: 1988 All Veh
Cal. Year: 62.5mph 751 Veh. Type: Veh. Spd.: VHT Mix: Composite E Total HC:	1992 Ant 0XCS LDGV 62.5 0.870 Emission 2.19	I/M ti-tam. Minin Perin LDGT1 62.5 0.000 Facto 2.36	Region Program Program mum Temp od 1 RVP LDGT2 62.5 0.000 rs (Gm/M 3.54	1: Low 1: No 1: No 1: 59. 11.5 LDGT 11Le) 0.00	Ar Oper (F) Ma Pd HDGV 62.5 0.000 8.05	Alti mbient rating eriod 2 LDDV 62.5 0.000 0.30	tude: 1 Temp: Mode: Temp: 9 RVP: 1 LDDT 62.5 0.000 0.40	500. Ft. 75.0 / 0.0 / 1. (F) 1.5 Per HDDV 62.5 0.130 1.14	75.0 / 0.0 / iod 2 Y MC 62.5 0.000 5.62	75.0 F 0.0 r: 1988 All Veh
Cal. Year: 62.5mph 751 Veh. Type: Veh. Spd.: VHT Mix: Composite E Total HC: Exhst HC:	1992 An: 0xcs LDGV 62.5 0.870 5.19 0.77	I/M ti-tam. Minin Perin LDGT1 62.5 0.000 Facto 2.36 0.86	Region Program Program mum Temp od 1 RVP LDGT2 62.5 0.000 rs (Gm/H 3.54 1.12	1: Low 1: No 1: No 1: 59. 11.5 LDGT 0.00 0.00	Ar Oper (F) Ma HDGV 62.5 0.000 8.05 1.25	Alti mbient rating aximum eriod 2 LDDV 62.5 0.000 0.30 0.30	tude: 1 Temp: 9 Mode: Temp: 9 RVP: 1 LDDT 62.5 0.000 0.40 0.40	500. Ft. 75.0 / 0.0 / 1. (F) 1.5 Per HDDV 62.5 0.130 1.14 1.14	75.0 / 0.0 / iod 2 Y MC 62.5 0.000 5.62 1.68	75.0 F 0.0 r: 1988 All Veh 2.06 0.82
Cal. Year: 62.5mph 751 Veh. Type: Veh. Spd.: VHT Mix: Composite B Total HC: Exhst HC: Evap. HC:	1992 An: 0XCS LDGV 62.5 0.870 2.19 0.77 1.20	I/M ti-tam. Minin Perin LDGT1 62.5 0.000 Facto 2.36 0.86 1.29	Region Program Program mum Temp od 1 RVP LDGT2 62.5 0.000 rs (Gm/M 3.54 1.12 2.17	1: Low 1: No 1: No 1: 59. 1: 11.5 LDGT 1: Le) 0.00 0.00 0.00	Ar Oper (F) Hi P(HDGV 62.5 0.000 8.05 1.25 6.42	Alti mbient rating eriod 2 LDDV 62.5 0.000 0.30 0.30	tude: 1 Temp: 9 Node: Temp: 9 RVP: 1 LDDT 62.5 0.000 0.40 0.40	500. Ft. 75.0 / 0.0 / 1. (F) 1.5 Per- HDDV 62.5 0.130 1.14 1.14	75.0 / 0.0 / iod 2 Y MC 62.5 0.000 5.62 1.68 3.48	75.0 F 0.0 r: 1988 All Veh 2.06 0.82 1.04
Cal. Year: 62.5mph 751 Veh. Type: Veh. Spd.: VHT Mix: Composite E Total HC: Exhst HC: Evap. HC: Refuel HC:	1992 Anti- 0XCS LDGV 62.5 0.870 Emission 2.19 0.77 1.20 0.00	I/M ti-tam. Minii Peri LDGT1 62.5 0.000 Facto 2.36 0.86 0.86 1.29 0.00	Region Program Program mum Temp od 1 RVP LDGT2 62.5 0.000 rs (Gm/H 3.54 1.12 2.17 0.00	1: Low 1: No 1: No 1: 59. 1: 11.5 LDGT 1: Le) 0.00 0.00 0.00 0.00	Ar Oper (F) Mi P(HDGV 62.5 0.000 8.05 1.25 6.42 0.00	Alti mbient rating eriod 2 LDDV 62.5 0.000 0.30 0.30	tude: 1 Temp: 9 RVP: 1 LDDT 62.5 0.000 0.40 0.40	500. Ft. 75.0 / 0.0 / 1. (F) 1.5 Per HDDV 62.5 0.130 1.14 1.14	75.0 / 0.0 / iod 2 Y MC 62.5 0.000 5.62 1.68 3.48	75.0 F 0.0 r: 1988 All Veh 2.06 0.82 1.04 0.00
Cal. Year: 62.5mph 751 Veh. Type: Veh. Spd.: VHT Mix: Composite B Total HC: Exhst HC: Evap. HC: Refuel HC: Runing HC:	1992 Anti- 0%CS LDGV 62.5 0.870 2.19 0.77 1.20 0.00 0.12	I/M ti-tam. Minii Perii LDGT1 62.5 0.000 Facto 2.36 0.86 1.29 0.00 0.12	Region Program Program Mum Temp od 1 RVP LDGT2 62.5 0.000 rs (Gm/H 3.54 1.12 2.17 0.00 0.15	1: Low 1: No 1: No 1: 59. 1: 11.5 LDGT 0.00 0.00 0.00 0.00 0.00 0.00	Ar Oper (F) Ma Po HDGV 62.5 0.000 8.05 1.25 6.42 0.00 0.24	Alti mbient rating f eriod 2 LDDV 62.5 0.000 0.30 0.30	tude: 1 Temp: 9 RVP: 1 LDDT 62.5 0.000 0.40 0.40	500. Ft. 75.0 / 0.0 / 1. (F) 1.5 Per HDDV 62.5 0.130 1.14 1.14	75.0 / 0.0 / iod 2 Y MC 62.5 0.000 5.62 1.68 3.48	75.0 F 0.0 r: 1988 All Veh 2.06 0.82 1.04 0.00 0.10
Cal. Year: 62.5mph 751 Veh. Type: Veh. Spd.: VHT Mix: Composite H Total HC: Exhst HC: Evap. HC: Refuel HC: Runing HC: Rsting HC:	1992 Anti- 0XCS LDGV 62.5 0.870 2.19 0.77 1.20 0.00 0.12 0.11	I/M ti-tam. Minii Peri LDGT1 62.5 0.000 Facto 2.36 0.86 1.29 0.00 0.12 0.09	Region Program Program Mum Temp od 1 RVP LDGT2 62.5 0.000 rs (Gm/H 3.54 1.12 2.17 0.00 0.15 0.10	1: Low 1: No 1: No 1: S9. 1: 11.5 LDGT 0.00 0.00 0.00 0.00 0.00 0.00	Ar Oper (F) Ma Po HDGV 62.5 0.000 8.05 1.25 6.25 0.25 0.24 0.02 0.24 0.13	Alti mbient rating eriod 2 LDDV 62.5 0.000 0.30 0.30	tude: 9 Temp: 9 RVP: 1 LDDT 62.5 0.000 0.40 0.40	500. Ft. 75.0 / 0.0 / 1. (F) 1.5 Per HDDV 62.5 0.130 1.14 1.14	75.0 / 0.0 / iod 2 Y MC 62.5 0.000 5.62 1.68 3.48 0.46	75.0 F 0.0 r: 1988 All Veh 2.06 0.82 1.04 0.00 0.10 0.10
Cal. Year: 62.5mph 751 Veh. Type: Veh. Spd.: VHT Mix: Composite H Total HC: Exhst HC: Evap. HC: Refuel HC: Refuel HC: Runing HC: Rsting HC: Exhst CO:	1992 Anti- 0%CS LDGV 62.5 0.870 2.19 0.77 1.20 0.00 0.12 0.11 15.71	I/M ti-tam. Minin Perin LDGT1 62.5 0.000 Facto 2.36 0.86 1.29 0.00 0.12 0.09 0.00	Region Program Program Mum Temp od 1 RVP LDGT2 62.5 0.000 rs (Gm/H 3.54 1.12 2.17 0.00 0.15 0.10 0.00	1: Low 1: No 1: No 1: S9. 1: 11.5 LDGT 1: Le) 0.00 0.00 0.00 0.00 0.00 0.00 0.00	Ar Oper (F) Ma Po HDGV 62.5 0.000 8.05 1.25 6.42 0.00 0.24 0.13 0.00	Alti mbient rating eriod 2 LDDV 62.5 0.000 0.30 0.30	tude: 1 Temp: 9 RVP: 1 LDDT 62.5 0.000 0.40 0.40	500. Ft. 75.0 / 0.0 / 1. (F) 1.5 Per HDDV 62.5 0.130 1.14 1.14 7.00	75.0 / 0.0 / iod 2 Y MC 62.5 0.000 5.62 1.68 3.48 0.46 0.00	75.0 F 0.0 r: 1988 All Veh 2.06 0.82 1.04 0.00 0.10 0.10 14.57
Cal. Year: 62.5mph 751 Veh. Type: Veh. Spd.: VMT Mix: Composite H Total HC: Exhst HC: Evap. HC: Refuel HC: Refuel HC: Rsting HC: Exhst CO: Exhst NOX:	1992 Anti- 7 0%CS LDGV 62.5 0.870 5.19 0.77 1.20 0.00 0.12 0.11 15.71 1.21	I/M ti-tam. Peri LDGT1 62.5 0.000 Facto 2.36 0.86 1.29 0.00 0.12 0.09 0.00 0.00	Region Program Program Mum Temp od 1 RVP LDGT2 62.5 0.000 rs (Gm/H 3.54 1.12 2.17 0.00 0.15 0.10 0.00 0.00	1: Low 1: No 1: No 1: S9. 1: 11.5 LDGT 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00	Ar Oper (F) Ma Po HDGV 62.5 0.000 8.05 1.25 6.42 0.00 0.24 0.24 0.13 0.00 0.00	Alti mbient rating f eriod 2 LDDV 62.5 0.000 0.30 0.30 0.30 0.00 0.00	tude: 9 Temp: 9 RVP: 1 LDDT 62.5 0.000 0.40 0.40 0.40 0.00	500. Ft. 75.0 / 0.0 / 1. (F) 1.5 Per HDDV 62.5 0.130 1.14 1.14 7.00 24.62	75.0 / 0.0 / iod 2 Y MC 62.5 0.000 5.62 1.68 3.48 0.46 0.00 0.00	75.0 F 0.0 r: 1988 All Veh 2.06 0.82 1.04 0.00 0.10 0.10 14.57 4.25
Cal. Year: 62.5mph 751 Veh. Type: Veh. Spd.: VMT Mix: Composite H Total HC: Exhst HC: Evap. HC: Refuel HC: Refuel HC: Rsting HC: Exhst CO: Exhst CO: Exhst NOX: Hot Stabil	1992 An: 0xCs LDGV 62.5 0.870 2.19 0.77 1.20 0.07 1.20 0.11 15.71 1.21 ized Id	I/M ti-tam. Minii Perii LDGT1 62.5 0.000 Facto 2.36 0.86 1.29 0.00 0.12 0.09 0.00 0.00 0.00 Le Emis	Region Program Program Mum Temp od 1 RVP LDGT2 	1: Low 1: No 1: No 1: S9. 1: 11.5 LDGT 0.000 0.00	Ar Oper (F) Ma HDGV 62.5 0.000 8.05 1.25 6.42 0.00 0.24 0.13 0.00 0.00 Gm/Hr)	Alti mbient rating f eriod 2 LDDV 62.5 0.000 0.30 0.30 0.30 0.00 0.00	tude: 9 Temp: 9 RVP: 1 LDDT 62.5 0.000 0.40 0.40 0.40	500. Ft. 75.0 / 0.0 / 1. (F) 1.5 Per HDDV 62.5 0.130 1.14 1.14 7.00 24.62	75.0 / 0.0 / iod 2 Y MC 62.5 0.000 5.62 1.68 3.48 0.46 0.00 0.00	75.0 F 0.0 r: 1988 All Veh 2.06 0.82 1.04 0.00 0.10 0.10 14.57 4.25
Cal. Year: 62.5mph 751 Veh. Type: Veh. Spd.: VMT Mix: Composite H Total HC: Exhst HC: Evap. HC: Refuel HC: Rsting HC: Exhst CO: Exhst CO: Exhst NOX: Hot Stabil Idle HC:	1992 An: 0xcs LDGV 62.5 0.870 2.19 0.77 1.20 0.00 0.12 0.11 15.71 1.21 ized Id 24.27	I/M ti-tam. Minii Perii LDGT1 62.5 0.000 Facto 2.36 0.86 1.29 0.00 0.12 0.09 0.00 0.00 0.00 le Emis: 0.00	Region Program Program Mum Temp od 1 RVP LDGT2 	1: Low 1: No 1: No 1: S9. 1: 11.5 LDGT 0.00 0.0	Ar Oper (F) Ma HDGV 62.5 0.000 8.05 1.25 6.42 0.00 0.24 0.13 0.00 0.21 0.00 Gm/Hr) 0.00	Alti mbient rating f eriod 2 LDDV 62.5 0.000 0.30 0.30 0.00 0.00 0.00	tude: 1 Temp: 9 RVP: 1 LDDT 62.5 0.000 0.40 0.40 0.00 0.00	500. Ft. 75.0 / 0.0 / 1. (F) 1.5 Per HDDV 62.5 0.130 1.14 1.14 7.00 24.62 17.37	75.0 / 0.0 / iod 2 Y MC 62.5 0.000 5.62 1.68 3.48 0.46 0.00 0.00 0.00	75.0 F 0.0 r: 1988 All Veh 2.06 0.82 1.04 0.00 0.10 0.10 14.57 4.25 23.37
Cal. Year: 62.5mph 751 Veh. Type: Veh. Spd.: VMT Mix: Composite H Total HC: Exhst HC: Evap. HC: Refuel HC: Runing HC: Exhst CO: Exhst NOX: Hot Stabil Idle HC: Idle CO:	1992 An: 0xCs LDGV 62.5 0.870 62.5 0.870 2.19 0.77 1.20 0.00 0.12 0.11 15.71 1.21 15.71 1.21 12ed Id 24.27 293.10	I/M ti-tam. Minii Perii LDGT1 62.5 0.000 Facto 2.36 0.86 1.29 0.00 0.12 0.09 0.00 0.00 le Emis 0.00 0.00	Region Program Program Mum Temp od 1 RVP LDGT2 	1: Low 1: No 1: No 1: S9. 1: 11.5 LDGT 0.00 0.0	Ar Oper (F) Ma HDGV 62.5 0.000 8.05 1.25 6.42 0.00 0.24 0.24 0.24 0.00 0.24 0.00 0.24 0.00 0.00	Alti mbient rating f eriod 2 LDDV 62.5 0.000 0.30 0.30 0.00 0.00 0.00 0.00	tude: 1 Temp: Mode: Temp: 9 RVP: 1 LDDT 62.5 0.000 0.40 0.40 0.40 0.00 0.00 0.00	500. Ft. 75.0 / 0.0 / 1. (F) 1.5 Per- HDDV 62.5 0.130 1.14 1.14 7.00 24.62 17.37 51.18	75.0 / 0.0 / iod 2 Y MC 62.5 0.000 5.62 1.68 3.48 0.46 0.00 0.00 0.00	75.0 F 0.0 r: 1988 All Veh 2.06 0.82 1.04 0.00 0.10 14.57 4.25 23.37 261.65
Cal. Year: 62.5mph 751 Veh. Type: Veh. Spd.: VHT Mix: Composite B Total HC: Exhst HC: Evap. HC: Refuel HC: Runing HC: Rsting HC: Exhst NOX: Hot Stabil Idle HC: Idle NOX:	1992 An: 0XCS LDGV 62.5 0.870 2.19 0.77 1.20 0.00 0.12 0.11 15.71 1.21 122d Id 24.27 293.10 2.90	I/M ti-tam. Minin Perin LDGT1 62.5 0.000 Facto 2.36 0.86 1.29 0.00 0.12 0.09 0.00 0.00 0.00 0.00 0.00 0.00	Region Program Program Mum Temp od 1 RVP LDGT2 62.5 0.000 rs (Gm/H 3.54 1.12 2.17 0.00 0.15 0.10 0.00 0.00 0.00 0.00 0.00	1: Low 1: No 1: No 1: S9. 1: 11.5 LDGT 0.00	Ar Oper (F) Ma HDGV 62.5 0.000 8.05 1.25 6.42 0.00 0.24 0.13 0.00 0.24 0.13 0.00 0.00 0.00 0.00	Alti mbient rating f eriod 2 LDDV 62.5 0.000 0.30 0.30 0.00 0.00 0.00 0.00 0	tude: 1 Temp: Mode: Temp: 9 RVP: 1 LDDT 62.5 0.000 0.40 0.40 0.00 0.00 0.00 0.00 0	500. Ft. 75.0 / 0.0 / 1. (F) 1.5 Per HDDV 62.5 0.130 1.14 1.14 1.14 7.00 24.62 17.37 51.18 22.32	75.0 / 0.0 / iod 2 Y MC 62.5 0.000 5.62 1.68 3.48 0.46 0.00 0.00 0.00 0.00	75.0 F 0.0 r: 1988 All Veh 2.06 0.82 1.04 0.00 0.10 14.57 4.25 23.37 261.65 5.43

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Cal. Year: 19	92	Region	: Low		Alti	tude:	500. Ft	•	
••••	1/M	Program	: No	Ar	nbient '	emp:	75.0 /	75.0	75.0 F
	Anti-tam.	Program	: No	Oper	ating H	lode:	0.0 /	0.0	0.0
65.0mph 75F 0	zcs						· .		
0	Mini	mum Temp	: 59.	(F) Ma	aximum	lemp: 9	1. (F)		
	Peri	od 1 RVP	: 11.5	P	eriod 2	RVP: 1	1.5 Per	iod 2)	(r: 1988
Veh. Type: L	DGV LDGT1	LDGT2	LDGT	HDGV	LDDV	LDDT	HDDV	MC	All Veh
Veh. Spd.: 65	.0 65.0	65.0		65.0	65.0	65.0	65.0	65.0	
VMT Hix: 0	.870 0.000	0.000		0.000	0.000	0.000	0.130	0.000)
Composite Emi	ssion Facto	rs (Gm/M	ile)						
Total HC: 2	.23 2.40	3.60	0.00	8.05	0.30	0.40	1.15	5.73	2.09
Exhst HC: 0	.82 0.91	1.19	0.00	1.28	0.30	0.40	1.15	1.79	0.86
Evap. HC: 1	.20 1.29	2.17	0.00	6.42				3.48	1.04
Refuel HC: 0	.00 0.00	0.00	0.00	0.00					0.00
Runing HC: 0	.11 0.11	0.14	0.00	0.23					0.10
Rsting HC: 0	.11 0.09	0.10	0.00	0.13				0.46	0.10
Exhst CO: 17	.60 0.00	0.00	0.00	0.00	0.00	0.00	7.51	0.00	16.29
Exhst NOX: 1	.29 0.00	0.00	0.00	0.00	0.00	0.00	27.38	0.00	4.68
Hot Stabilize	d Idle Emis	sion Fac	tors (Gm/Hr)					
Idle HC: 24	.27 0.00	0.00	0.00	0.00	0.00	0.00	17.37	0.00	23.37
Idle CO:293	.10 0.00	0.00	0.00	0.00	0.00	0.00	51.18	0.00	261.65
Idle NOX: 2	.90 0.00	0.00	0.00	0.00	0.00	0.00	22.32	0.00	5.43

APPENDIX B: EQUIVALENT EMISSION RATE MODELS FOR ACCELERATION AND DECELERATION MODES





Figure B.1. Equivalent CO Emission Rate Model Under Acceleration (Passenger Cars).







Figure B.3. Equivalent HC Emission Rate Model Under Acceleration (Passenger Cars).



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Figure B.5. Equivalent NO_x Emission Rate Model Under Acceleration (Passenger Cars).



Figure B.6. Equivalent NO_x Emission Rate Model Under Acceleration (Trucks).



Figure B.7. Equivalent NO_X Emission Rate Model Under Deceleration (Passenger Cars).





APPENDIX C:

MODAL EMISSION RATE MODELS USED IN QUEWZEE

(PASSENGER CARS)


CARBON MONOXIDE

$$\begin{split} m_{COi} &= k_1 * 293.1 \text{ (gm/hr).} \\ m_{COd} &= k_1 * 1.5 * 293.1 \text{ (gm/hr).} \\ m_{COcri} &= k_1 * 19.41 * 16.2 * (0.494 + 0.000227 V_{cri}^2) \text{ (gm/hr).} \\ m_{COai} &= k_1 * (1011.4 - 9.0 * V_{ai} + 0.804 * V_{ai}^2 - 0.04903 * V_{ai}^3 + 0.000729 * V_{ai}^4) \text{ (gm/hr).} \end{split}$$

HYDROCARBONS

^m HCi	=	k ₃ * 24.27 (gm/hr).
mHCd	= '	k ₃ * 24.27 (gm/hr).
m _{HCcri}	=	k ₃ * 24.27 (gm/hr).
m _{HCai}	=	k ₃ * (5.8127 - 0.14173 * V _{ai} + 1.4535e-2 * V _{ai} ² -
		3.4403e-4 * V _{ai} ³ + 2.8941e-6 * V _{ai} ⁴) (gm/hr).

NITROGEN OXIDES

 $m_{NOxi} = k_5 * 2.9 (gm/hr).$

- $m_{NOxd} = k_5 * (-8.1618e-3 + 3.0774 * V_d 4.8009e-4 * V_d^2 1.3859e-6 * V_d^3 + 1.3574e-7 * V_d^4) (gm/hr).$
- $m_{NOxcri} = k_5 * 2.9 (gm/hr).$
- $m_{NOxai} = k_5 * (-0.20963 + 0.15404 * V_{ai} 4.5707e 3 * V_{ai}^2 + 6.0109e 5 * V_{ai}^3) (gm/hr).$



APPENDIX D:

MODAL EMISSION RATE MODELS USED IN QUEWZEE

(TRUCKS)



CARBON MONOXIDE

$$\begin{split} m_{COi} &= k_2 * 51.18 \text{ (gm/hr).} \\ m_{COd} &= k_2 * 1.5 * 51.18 \text{ (gm/hr).} \\ m_{COcri} &= k_2 * 14.95 * 16.2 * (0.494 + 0.000227 V_{cri}^2) \text{ (gm/hr).} \\ m_{COai} &= k_2 * (20.125 + 8.5098 * V_{ai} - 0.37135 * V_{ai}^2 + 6.1456e - 3 * V_{ai}^3 - 2.9472e - 5 * V_{ai}^4) \text{ (gm/hr).} \end{split}$$

HYDROCARBONS

^m HCi	=	k ₄ * 17.37 (gm/hr).
mHCd	=	k ₄ * 17.37 (gm/hr).
^m HCcri	=	k ₄ * 17.37 (gm/hr).
^m HCai	=	$k_4 * (0.16072 + 0.21664 * V_{ai} - 7.7947e - 3 * V_{ai}^2 +$
		1.216e-4 * V _{ai} ³ - 6.4191e-7 * V _{ai} ⁴) (gm/hr).

NITROGEN OXIDES

- $m_{NOxi} = k_6 * 22.32 (gm/hr).$
- $m_{NOxd} = k_6^* (-0.20101 + 0.31205^* V_d 1.01e 2^* V_d^2 + 1.4347e 4^* V_d^3) (gm/hr).$
- $m_{NOxcri} = k_6 * 22.32 (gm/hr).$
- $m_{NOxai} = k_6^* (-0.69458 + 1.046^* V_{ai} 3.3855e 2^* V_{ai}^2 + 4.8059e 4^* V_{ai}^3) (gm/hr).$



APPENDIX E: SOURCE CODE FOR THE QUEWZEE MODEL EMISSIONS PROCEDURE



{ ----- MODEL FOR PREDICTION OF EXCESS EMISSIONS ----- }

procedure emissions(dir,time: integer);

var

minspeed, lengthredspd, timedecel, timedecel, tr, lengthdecel, lengthdecel_tr, spddecel, spddecel_tr, timeaccel1, timeaccel1_tr, lengthaccel1, lengthaccel1_tr, spdaccel1, spdaccel1_tr, timewzone, timewzone_tr, timeaccel2, timeaccel2 tr, lengthaccel2, lengthaccel2_tr, spdaccel2, spdaccel2_tr, timequeue, aff_length, aff_length_tr, time_aff, time_aff_tr, idle_CO, idle_CO_tr, idle_HC, idle_HC_tr, idle_NOX, idle_NOX tr, scen_CO, scen_CO tr, corr_CO car, corr_CO tr, corr_HC car, corr_HC_tr, corr_NOX_car, corr_NOX_tr: real; i : pollutant: em_rate : array[pollutant,mode,vehicle] of real; begin { Calculation of minimum speed near the work zone } minspeed := speed[2,dir,time] - 2.3 - 25.7*sqr(vc[2]); { Accounting for the hour when queue dissipation occurs } if queindex = 2 then minspeed := minspeed*(1-queclear); if (queindex = 1) or (minspeed<=0) then minspeed := 0: Calculation of effective length of closure } lengthredspd := $0.1 + (wzlength + 0.1)^*(vc[2]);$ if lengthredspd < 0.3 then lengthredspd := 0.3; { Calculation of time and length over which deceleration occurs near WZ } timedecel := 1.467*(minspeed - speed[1,dir,time])/decel_rate; timedecel_tr := 1.467*0.9*(minspeed - speed[1,dir,time])/decel_rate_tr; lengthdecel := 1.467*speed[1,dir,time]*timedecel + 0.5*decel_rate*sqr(timedecel); lengthdecel_tr := 1.467*0.9*speed[1,dir,time]*timedecel_tr + 0.5*decel_rate_tr*sqr(timedecel_tr); spddecel := lengthdecel/(1.467*timedecel); spddecel_tr := lengthdecel_tr/(1.467*timedecel_tr); { Calculation of time and length over which acceleration occurs (Zone 1) } timeaccel1 := 1.467*(speed[2,dir,time] - minspeed)/accel_rate; timeaccel1_tr := 1.467*0.9*(speed[2,dir,time] - minspeed)/accel_rate_tr; lengthaccel1 := 1.467*minspeed*timeaccel1 + 0.5*accel_rate*sqr(timeaccel1); lengthaccel1_tr := 1.467*0.9*minspeed*timeaccel1_tr + 0.5*accel_rate_tr*sqr(timeaccel1_tr); spdaccel1 := lengthaccel1/(1.467*timeaccel1); spdaccel1_tr := lengthaccel1_tr/(1.467*timeaccel1_tr); { Calculation of time spent in the WZ traveling at WZ average speed } timewzone := 3600*lengthredspd/speed[2,dir,time]; timewzone_tr := 3600*lengthredspd/(0.9*speed[2,dir,time]); { Calculation of time and length over which acceleration occurs (Zone 2) } timeaccel2 := 1.467*(speed[1.dir.time] - speed[2.dir.time]) /accel rate: timeaccel2_tr := 1.467*0.9*(speed[1,dir,time] - speed[2,dir,time])

/accel_rate_tr; lengthaccel2 := 1.467*speed[2,dir,time]*timeaccel2 + 0.5*accel_rate*sqr(timeaccel2); lengthaccel2_tr := 1.467*0.9*speed[2,dir,time]*timeaccel2_tr + 0.5*accel_rate_tr*sqr(timeaccel2_tr); := lengthaccel2/(1.467*timeaccel2); spdaccel2 := lengthaccel2 tr/(1.467*timeaccel2 tr); spdaccel2 tr

Modal Emission Rate Calculations

{

}

{ Idle Rates Obtained from Base Scenario } idle CO := 293.1; idle CO tr := 51.2; Runs of the MOBILE4.1 idle HC := 24.3; Model for a Low Altitude Region, { 100 % Hot Stabilized Operation Mode } idle HC tr := 17.4; { and 75 F Ambient Temperature. idle NOX := 2.9; idle_NOX_tr := 22.3; { with no ATP or I/M Programs in Effect }

corr_CO_car := idleCOcar/idle_CO; corr_CO_tr := idleCOtr/idle_CO_tr; corr_HC_car := idleHCcar/idle_HC; corr_HC_tr := idleHCtr/idle_HC_tr; corr_NOX_car:= idleNOXcar/idle_NOX; { Rates of the Actual vs the corr_NOX_tr := idleNOXtr/idle_NOX_tr; {

{ Correction Factors for Scenarios Other than the Base Scenario. Factors are } based on the Idle Emission } Base Scenarios }

}

}

scen_CO := 314.44; {16.2 mph LDGV Scenario Rate*16.2} scen_CO_tr := 242.19; {16.2 mph HDDV Scenario Rate*16.2}

em_rate[CO,idle,carr] := corr_CO_car*idle_CO/3600; em_rate[CO,decel,carr] := corr_CO_car*1.5*idle_CO/3600; em_rate[CO,accel1,carr] := corr_CO_car*(1011.4 - 9.0*spdaccel1 + 0.804*power(spdaccel1,2)

- 4.903e-02*power(spdaccel1,3)

+ 7.29e-04*power(spdaccel1,4)

)/3600;

em_rate[CO,accel2,carr] := corr_CO_car*(1011.4 - 9.0*spdaccel2 + 0.804*power(spdaccel2,2)

- 4.903e-02*power(spdaccel2,3)

+ 7.29e-04*power(spdaccel2,4)

)/3600;

em_rate[CO,cruise1,carr] := corr_CO_car*scen_CO*(0.494 + 0.000227 *power(speed[2,dir,time],2))/3600;

em_rate[CO,cruise2,carr] := corr_CO_car*scen_CO*(0.494 + 0.000227 *power(speed[1,dir,time],2))/3600;

em_rate[CO,idle,truck] := corr_CO_tr*idle_CO_tr/3600; em_rate[CO,decel,truck] := corr_CO_tr*1.5*idle_CO_tr/3600; em_rate[CO,accel1,truck] := corr_CO_tr*(20.125 + 8.5098*spdaccel1_tr - 0.37135*power(spdaccel1_tr,2) + 6.1456e-03*power(spdaccel1_tr,3) - 2.9472e-05*power(spdaccel1_tr,4)

)/3600:

em_rate[CO,accel2,truck] := corr_CO_tr*(20.125 + 8.5098*spdaccel2_tr - 0.37135*power(spdaccel2 tr,2)

+ 6.1456e-03*power(spdaccel2_tr,3) - 2.9472e-05*power(spdaccel2_tr,4))/3600; em_rate[CO,cruise1,truck]:= corr_CO_tr*scen_CO_tr*(0.494 + 0.000227 *power(0.9*speed[2,dir,time],2))/3600; em_rate[CO,cruise2,truck]:= corr_CO_tr*scen_CO_tr*(0.494 + 0.000227 *power(0.9*speed[1,dir,time],2))/3600; em rate[HC,idle,carr] := corr_HC_car*idle_HC/3600; := corr_HC_car*idle_HC/3600; em_rate[HC,decel,carr] em_rate[HC,accel1,carr] := corr_HC_car*(5.8127 - 0.14173*spdaccel1 + 1.4535e-02*power(spdaccel1,2) - 3.4403e-04*power(spdaccel1,3) + 2.8941e-06*power(spdaccel1,4))/3600: em_rate[HC,accel2,carr] := corr_HC_car*(5.8127 - 0.14173*spdaccel2 + 1.4535e-02*power(spdaccel2,2) - 3.4403e-04*power(spdaccel2,3) + 2.8941e-06*power(spdaccel2,4))/3600; em_rate[HC,cruise1,carr] := corr_HC_car*idle_HC/3600; em_rate[HC,cruise2,carr] := corr_HC_car*idle_HC/3600; em_rate[HC,idle,truck] := corr_HC_tr*idle_HC_tr/3600; em_rate[HC,decel,truck] := corr_HC_tr*idle_HC_tr/3600; em_rate[HC,accel1,truck] := corr_HC_tr*(0.16072 + 0.21664*spdaccel1_tr - 7.7947e-03*power(spdaccel1_tr,2) + 1.216e-04*power(spdaccel1_tr,3) - 6.4191e-07*power(spdaccel1_tr,4))/3600: em_rate[HC,accel2,truck] := corr_HC_tr*(0.16072 + 0.21664*spdaccel2_tr -7.7947e-03*power(spdaccel2_tr,2) + 1.216e-04*power(spdaccel2_tr,3) - 6.4191e-07*power(spdaccel2 tr,4))/3600; em_rate[HC,cruise1,truck] := corr_HC_tr*idle_HC_tr/3600; em rate[HC,cruise2,truck] := corr HC tr*idle HC tr/3600; em_rate[NOX,idle,carr] := corr NOX car*idle NOX/3600; em rate[NOX,decel,carr] := corr NOX car*(-8.1618e-03 + 3.0774e-02*spddecel - 4.8009e-04*power(spddecel,2) - 1.3859e-06*power(spddecel,3) + 1.3574e-07*power(spddecel,4))/3600; em_rate[NOX,accel1,carr] := corr_NOX_car*(-0.20963 + 0.15404*spdaccel1 - 4.5707e-03*power(spdaccel1,2) + 6.0109e-05*power(spdaccel1,3) 1/3600: em_rate[NOX,accel2,carr] := corr_NOX_car*(-0.20963 + 0.15404*spdaccel2 - 4.5707e-03*power(spdaccel2,2) + 6.0109e-05*power(spdaccel2,3))/3600;

em_rate[NOX,cruise1,carr] := corr_NOX_car*idle_NOX/3600; em_rate[NOX,cruise2,carr] := corr_NOX_car*idle_NOX/3600; em_rate[NOX,idle,truck] := corr_NOX_tr*idle_NOX_tr/3600; em_rate[NOX,decel,truck] := corr_NOX_tr*(-0.20101 + 0.31205*spddecel_tr - 1.01e-02*power(spddecel_tr,2) + 1.4347e-04*power(spddecel_tr,3))/3600; em_rate[NOX,accel1,truck] := corr_NOX_tr*(-0.69458 + 1.046*spdaccel1_tr - 3.3855e-02*power(spdaccel1_tr,2) + 4.8059e-04*power(spdaccel1_tr,3))/3600: em_rate[NOX,accel2,truck] := corr_NOX_tr*(-0.69458 + 1.046*spdaccel2_tr - 3.3855e-02*power(spdaccel2 tr,2) + 4.8059e-04*power(spdaccel2_tr,3) V3600: em_rate[NOX,cruise1,truck] := corr_NOX_tr*idle_NOX_tr/3600; em_rate[NOX,cruise2,truck] := corr_NOX_tr*idle_NOX_tr/3600; if queindex = 0 then begin { Calculation of total length over which traffic is affected } due to the presence of the work zone aff_length := lengthdecel + lengthaccel1 + 5280*lengthredspd + lengthaccel2; aff_length_tr := lengthdecel_tr + lengthaccel1_tr + 5280*lengthredspd + lengthaccel2_tr; := aff_length/(1.467*speed[1,dir,time]); time_aff time_aff_tr := aff_length_tr/(0.9*1.467*speed[1,dir,time]); { Calculation of excess emission values using emission rates } (no queue formation) for i := CO to NOX do exc_emission[i,dir,time] := ((em_rate[i,decel,carr]*timedecel + em rate[i,accel1,carr]*timeaccel1 + em rate[i,accel2,carr]*timeaccel2 + em rate[i,cruise1,carr]*timewzone em rate[i,cruise2,carr]*time aff) * (1-(trucks[dir]/100)) (em_rate[i,decel,truck]*timedecel_tr + em rate[i,accel1,truck]*timeaccel1 tr + em_rate[i,accel2,truck]*timeaccel2_tr + em_rate[i,cruise1,truck]*timewzone_tr em rate[i,cruise2,truck]*time aff tr) * (trucks[dir]/100)) hrvol[dir,time]/1000; end else begin

{ Excess emissions under queueing conditions }

{ Calculation of average speed through the queue } speed[3,dir,time] := (freespd/2)*(1 - sqrt(1 - capacity [dir,time]/normalcapacity[dir])); { Calculation of time of travel through the queue (idling) } timequeue := 5280*quelength[dir,time]/(1.467*speed[3,dir,time]); { Calculation of total length over which traffic is } { affected due to the presence of the work zone } aff length := lengthdecel + 5280*guelength[dir,time] + lengthaccel1 + 5280*lengthredspd + lengthaccel2; aff_length_tr := lengthdecel_tr + 5280*quelength[dir,time] + lengthaccel1_tr + 5280*lengthredspd + lengthaccel2 tr: := aff length/(1.467*speed[1,dir,time]); time aff time aff tr := aff length $tr/(0.9^{1.467^{1.50}}speed[1,dir,time]);$ { Calculation of excess emission values using emission } rates (queue formation occurs) ł } for i := CO to NOX do exc_emission[i,dir,time] := ((em_rate[i,decel,carr]*timedecel + em_rate[i,idle,carr]*timequeue + em_rate[i,accel1,carr]*timeaccel1 + em_rate[i,accel2,carr]*timeaccel2 + em_rate[i,cruise1,carr]*timewzone em_rate[i,cruise2,carr]*time_aff) * (1-(trucks[dir]/100)) (em_rate[i,decel,truck]*timedecel_tr + em_rate[i,idle,truck]*timequeue + em_rate[i,accel1,truck]*timeaccel1_tr + em_rate[i,accel2,truck]*timeaccel2_tr + em_rate[i,cruise1,truck]*timewzone_tr em rate[i,cruise2,truck]*time aff tr) * (trucks[dirl/100)) * hrvol[dir.time]/1000;

end;

{ Total excess emissions for the direction }

for i := CO to NOX do

emission[i,dir] := emission[i,dir] + exc_emission[i,dir,time];

end;



APPENDIX F: OUTPUTS FROM TEST RUNS OF THE QUEWZEE MODEL



Echo of Input Data:

- 1. Problem Title: TEST PROBLEM 1
- 2. The major highway or freeway name is IH 35.
- 3. Free flow speed on IH 35 is 60.0 miles per hr.
- 4. Level of Service D/E speed on IH 35 is 40.0 miles per hr.
- 5. Speed in mph at capacity after queue formation on IH 35 is 30.0.
- Single direction closure workzone strategy. INBOUND direction is being considered.
- 7. Start of workzone traffic control setup is 8.
- 8. End of workzone traffic control setup is 17.
- 9. Start of actual work is 9.
- 10. End of actual work is 16.

11. Percent of 1981 dollars used to estimate current worth is 141%.

12. Idle CO emission rate for passenger cars is 293.1 gm/hr.
 13. Idle CO emission rate for trucks is 51.2 gm/hr.
 14. Idle HC emission rate for passenger cars is 24.3 gm/hr.
 15. Idle HC emission rate for trucks is 17.4 gm/hr.
 16. Idle NOX emission rate for passenger cars is 2.9 gm/hr.
 17. Idle NOX emission rate for trucks is 22.3 gm/hr.
 18. Total number of INBOUND lanes on IH 35 is 2 lanes.
 19. Total number of OPEN INBOUND during work on IH 35 is 1 lanes.

- 22. Percent INBOUND trucks on IH 35 is 13.0%
- 24. The length in miles from beginning of taper to end of work zone is 1.0 miles.
- 25. Maximum flow per INBOUND lane before work activity on IH 35 is 2000 vehicles per hour per lane.
- 27. LOS DE breakpoint volume per INBOUND lane before work activity on IH 35 is 1650 vehicles per hour per lane.
- 29. The capacity per lane of the INBOUND work zone is 1485 vphpl.

>>	>	INE	OUND <	<>>> Tota	al Lan	es: 2	Work	Zone	Lane	s: 1					
T	IM	E *	HRLY	*CAPACITY*	APP *	ZN *	QUE *		FUEL		ŧ		011	-	* USER
		1	VOL.	* INBOUND*	SPD *	SPD *	LEN *	CAR	*	TR	*	CAR	*	TR	* COST
0	۹	1	300	4000	58.2										
1	-	2	150	4000	59.1										
2	•	3	150	4000	59.1										
3		4	150	4000	59.1										
4	•	5	150	4000	59.1										
5		6	450	4000	57.3										
6	-	7	1850	4000	48.8										
7	'. . .	8	2250	4000	46.4										
8	•	9	1075	1800	53.5	45.5	0.0	46.	9	38.	9	1.2	2	0.8	120
9		10	850	1485	54.8	46.1	0.0	37.	5	31.	0	0.9	,	0.6	94
10	-	11	1000	1485	53.9	43.7	0.0	44.	7	38.	5	1.1		0.8	151
11	-	12	1050	1485	53.6	42.9	0.0	47.	2	41.	2	1.2	2	0.8	175
12		13	1500	1485	50.9	29.7	0.0	104.	4	104.	1	4.2	2	2.9	975
13	•	14	1225	1485	52.6	39.4	0.0	82.	5	81.	2	3.4	•	2.4	314
14		15	1325	1485	52.0	39.2	0.0	61.	2	56.	2	1.5	;	1.1	359
15		16	1625	1485	50.2	27.2	0.2	112.	5	112.	0	4.5	i	3.2	2082
16		17	2050	1800	47.6	25.8	0.8	134.	4	133.	3	5.0)	3.8	5353
17		18	2150	4000	47.0	43.4	0.6	91.	4	83.	5	2.6	5	2.0	837
18	-	19	1750	4000	49.4										
19	•	20	925	4000	54.4										
20	•	21	875	4000	54.7										
21	•	22	400	4000	57.6										
22	-	23	400	4000	57.6										
23	•	24	150	4000	59.1										

THE	SUM	OF	INBOUND	Truck	FUEL	is		719.8	gallons.
THE	SUM	OF	INBOUND	Car	FUEL	is		762.6	gallons.
THE	SUM	OF	INBOUND	Truck	OIL	is		18.3	quarts.
THE	SUM	OF	INBOUND	Car	01L	is		25.5	quarts.
THE	SUM	OF	INBOUND	WORKZO	ONE CO	ISTS	IS \$	10460)

>>>	INBO	UND <<	<>>> Total	lanes	: 2 Wor	·k Zone	Lanes: 1		
TIME	E *	HRLY	* CAPACITY	* APP	* ZN	* QUE	* E)	CESS EMISSION	S. *
	*	VOL .	* INBOUND	* SPD	* SPD	* LEN	* CO	* HC *	NOX *
0 -	1	300	4000	58.2					
1 -	2	150	4000	59.1					
2 -	3	150	4000	59.1					
3 -	4	150	4000	59.1					
4 -	5	150	4000	59.1					
5 -	6	450	4000	57.3					
6 -	7	1850	4000	48.8					
7 -	8	2250	4000	46.4					
8 -	9	1075	1800	53.5	45.5	0.0	0.8	0.0	0.0
9 -	10	850	1485	54.8	46.1	0.0	0.7	0.0	0.0
10 -	11	1000	1485	53.9	43.7	0.0	1.0	0.1	0.0
11 -	12	1050	1485	53.6	42.9	0.0	1.1	0.1	0.0
12 -	13	1500	1485	50.9	29.7	0.0	7.5	0.7	0.2
13 -	14	1225	1485	52.6	39.4	0.0	3.1	0.3	0.1
14 -	15	1325	1485	52.0	39.2	0.0	2.5	0.2	0.0
15 -	16	1625	1485	50.2	27.2	0.2	19.8	2.0	0.4
16 -	17	2050	1800	47.6	25.8	0.8	55.2	5.3	1.2
17 -	18	2150	4000	47.0	43.4	0.6	4.8	0.4	0.1
18 -	19	1750	4000	49.4	•				
19 -	20	925	4000	54.4					
20 -	21	875	4000	54.7					
21 -	22	400	4000	57.6					
22 -	23	400	4000	57.6					
23 -	24	150	4000	59.1					

THE	TOTAL	EXCESS	EMISSION	OF	CARBONMONOXIDES (CO) IS	96.5	kgs.
THE	TOTAL	EXCESS	EMISSION	OF	HYDROCARBONS (HC) IS	9.1	kgs.
THE	TOTAL	EXCESS	EMISSION	OF	NITROGEN OXIDES (NOX) IS	2.0	kgs.

Echo of Input Data:

- 1. Problem Title: TEST PROBLEM 2
- 2. The major highway or freeway name is IH 35.
- 3. Free flow speed on IH 35 is 60.0 miles per hr.
- 4. Level of Service D/E speed on IH 35 is 40.0 miles per hr.
- 5. Speed in mph at capacity after queue formation on IH 35 is 30.0.
- Single direction closure workzone strategy. INBOUND direction is being considered.
- 7. Start of workzone traffic control setup is 8.
- 8. End of workzone traffic control setup is 17.
- 9. Start of actual work is 9.
- 10. End of actual work is 16.

 $\mathcal{D}_{i}^{(i)}$

11. Percent of 1981 dollars used to estimate current worth is 141%.

12. Idle CO emission rate for passenger cars is 293.1 gm/hr.
 13. Idle CO emission rate for trucks is 51.2 gm/hr.
 14. Idle HC emission rate for passenger cars is 24.3 gm/hr.
 15. Idle HC emission rate for trucks is 17.4 gm/hr.
 16. Idle NOx emission rate for passenger cars is 2.9 gm/hr.
 17. Idle NOx emission rate for trucks is 22.3 gm/hr.
 18. Total number of INBOUND lanes on IH 35 is 2 lanes.
 19. Total number of OPEN INBOUND during work on IH 35 is 1 lanes.

22. Percent INBOUND trucks on IH 35 is 13.0%

- 24. The length in miles from beginning of taper to end of work zone is 2.0 miles.
- 25. Maximum flow per INBOUND lane before work activity on IN 35 is 2000 vehicles per hour per lane.
- 27. LOS DE breakpoint volume per INBOUND lane before work activity on IH 35 is 1650 vehicles per hour per lane.
- 29. The capacity per lane of the INBOUND work zone is 1485 vphpl.

>>> INBO	UND <<<>>>	Total Lan	es: 2 1	lork i	Zone Lane	es: 1			
TIME *	HRLY *CAPAC	ITY* APP *	ZN * (OUE *	FUEL	*	10	L *	USER
* *	VOL. * INBO	UND* SPD *	SPD * I	LEN *	CAR *	TR *	CAR *	TR *	COST
0 - 1	300 40	00 58.2							
1 - 2	150 40	00 59.1							
2 - 3	150 40	00 59.1							
3 - 4	150 40	00 59.1							
4 - 5	150 40	00 59.1							
5 - 6	450 40	00 57.3							
6 - 7	1850 40	00 48.8							
7 - 8	2250 40	00 46.4							
8 - 9	1075 18	00 53.5	45.5	0.0	93.9	77.8	2.4	1.6	150
9 - 10	850 14	85 54.8	46.1	0.0	75.0	62.0	1.9	1.3	117
10 - 11	1000 14	85 53.9	43.7	0.0	89.4	77.1	2.2	1.5	193
11 - 12	1050 14	85 53.6	42.9	0.0	94.3	82.3	2.3	1.6	226
12 - 13	1500 14	85 50.9	29.7	0.0	208.7	208.2	8.3	5.9	1319
13 - 14	1225 14	85 52.6	39.4	0.0	164.9	162.3	6.8	4.8	412
14 - 15	1325 14	85 52.0	39.2	0.0	122.4	112.3	3.0	2.1	472
15 - 16	1625 148	85 50.2	27.2	0.2	225.0	224.0	9.0	6.4	2537
16 - 17	2050 180	00 47.6	25.8	0.8	268.7	266.6	10.0	7.5	5963
17 - 18	2150 400	00 47.0	43.4	0.6	182.8	167.1	5.2	3.9	868
18 - 19	1750 400	00 49.4							
19 - 20	925 400	00 54.4							
20 - 21	875 400	00 54.7							
21 - 22	400 400	57.6							
22 - 23	400 400	00 57.6							
23 - 24	150 400	00 59.1							
THE SUM OF	F INBOUND	Truck FUEL	is	1439.	6 gallor	IS.			
THE SUM OF	F INBOUND (Car FUEL	is	1525.	2 gallor	IS.			
THE SUM OF	F INBOUND 1	Truck OIL	is	36.	6 quarts				
THE SUM OF	F INBOUND (Car OIL	is	50.	9 quarts				
THE SUM OF	F INBOUND V	ORKZONE CO	DSTS IS	\$ 122	258				

>>>	1 NB	OUND <<	<>>> Total	lanes:	2 Wor	k Zone	Lanes: 1			
TIM	E *	HRLY	* CAPACITY	* APP	* ZN	* QUE *	* E	XCESS EMISS	IONS	*
	*	VOL.	* INBOUND	* SPD	* SPD	* LEN	* CO	* HC	* NOX	*
0	4	300	4000	58.2						
1.	,	150	4000	50.2						
-	2	150	4000	50 1						
2	2	150	4000	59.1						
5	4	150	4000	59.1						
4 -	5	150	4000	59.1						
5 -	6	450	4000	57.3						
- 6	7	1850	4000	48.8						
7 -	8	2250	4000	46.4						
8 -	9	1075	1800	53.5	45.5	0.0	0.8	0.1	0.0	
9 -	10	850	1485	54.8	46.1	0.0	0.6	0.1	0.0	
10 -	11	1000	1485	53.9	43.7	0.0	1.0	0.1	0.0	
11 -	12	1050	1485	53.6	42.9	0.0	1.1	0.2	0.0	
12 -	13	1500	1485	50.9	29.7	0.0	8.5	1.2	0.3	
13 -	14	1225	1485	52.6	39.4	0.0	3.2	0.4	0.1	
14 -	15	1325	1485	52.0	39.2	0.0	2.6	0.4	0.1	
15 -	16	1625	1485	50.2	27.2	0.2	21.4	2.6	0.6	
16 -	17	2050	1800	47.6	25.8	0.8	57.7	6.1	1.4	
17 -	18	2150	4000	47.0	43.4	0.6	4.8	0.4	0.1	
18 -	19	1750	4000	49.4						
19 -	20	925	4000	54.4						
20 -	21	875	4000	54.7						
21 -	22	400	4000	57.6						
22 -	23	400	4000	57.6						
23 -	24	150	4000	59.1						

THE	TOTAL	EXCESS	EMISSION	OF	CARBONMONOXIDES (CO) IS	101.7 kgs.
THE	TOTAL	EXCESS	EMISSION	OF	HYDROCARBONS (HC) IS	11.7 kgs.
THE	TOTAL	EXCESS	EMISSION	OF	NITROGEN OXIDES (NOx) IS	2.6 kgs.

Echo of Input Data:

1. Problem Title: TEST PROBLEM 3

- 2. The major highway or freeway name is IH 35.
- 3. Free flow speed on IH 35 is 60.0 miles per hr.
- 4. Level of Service D/E speed on IH 35 is 40.0 miles per hr.
- 5. Speed in mph at capacity after queue formation on IH 35 is 30.0.
- 6. Single direction closure workzone strategy. INBOUND direction is being considered.
- 7. Start of workzone traffic control setup is 0.
- 8. End of workzone traffic control setup is 24.
- 9. Start of actual work is 9.
- 10. End of actual work is 16.

11. Percent of 1981 dollars used to estimate current worth is 141%.

12. Idle CO emission rate for passenger cars is293.1 gm/hr.13. Idle CO emission rate for trucks is51.2 gm/hr.14. Idle HC emission rate for passenger cars is24.3 gm/hr.15. Idle HC emission rate for trucks is17.4 gm/hr.16. Idle NOx emission rate for trucks is2.9 gm/hr.17. Idle NOx emission rate for trucks is2.9 gm/hr.18. Total number of INBOUND lanes on IH 35 is 2 lanes.

19. Total number of OPEN INBOUND during work on IH 35 is 1 lanes.

- 24. The length in miles from beginning of taper to end of work zone is 1.0 miles.
- 25. Maximum flow per INBOUND lane before work activity on IH 35 is 2000 vehicles per hour per lane.
- 27. LOS DE breakpoint volume per INBOUND lane before work activity on IH 35 is 1650 vehicles per hour per lane.
- 29. The capacity per lane of the INBOUND work zone is 1485 vphpl.

>>>	•	INBO	OUND <<<	>>> Tota	al Lane	es: 2	Work	Zone Lar	es: 1			
TI	M	E *	HRLY *C	APACITY*	APP *	ZN *	QUE *	FUE	L *	01	L	* USER
		*	VOL. *	INBOUND*	SPD *	SPD *	LEN *	CAR *	TR 🕈	CAR *	TR	* COST
0	•	1	300	1800	58.2	56.0	0.0	13.2	8.7	0.3	0.2	6
1	۰	2	150	1800	59.1	58.0	0.0	6.7	4.2	0.2	0.1	2
2	•	3	150	1800	59.1	58.0	0.0	6.7	4.2	0.2	0.1	2
3	•	4	150	1800	59.1	58.0	0.0	6.7	4.2	0.2	0.1	2
4	•	5	150	1800	59.1	58.0	0.0	6.7	4.2	0.2	0.1	2
5		6	450	1800	57.3	53.9	0.0	19.6	13.6	0.5	0.3	14
6	•	7	1850	1800	48.8	29.2	0.1	122.3	121.6	4.5	3.4	1447
7	•	8	2250	1800	46.4	22.5	0.8	146.3	144.7	5.5	4.1	5914
8	a	9	1075	1800	53.5	34.8	0.8	72.3	72.5	2.6	2.0	2890
9	۰	10	850	1485	54.8	46.1	0.0	37.5	31.0	0.9	0.6	94
10	•	11	1000	1485	53.9	43.7	0.0	44.7	38.5	1.1	0.8	151
11	۰	12	1050	1485	53.6	42.9	0.0	47.2	41.2	1.2	0.8	175
12	e	13	1500	1485	50.9	29.7	0.0	104.4	104.1	4.2	2.9	975
13	•	14	1225	1485	52.6	39.4	0.0	82.5	81.2	3.4	2.4	314
14	۰	15	1325	1485	52.0	39.2	0.0	61.2	56.2	1.5	1.1	359
15	•	16	1625	1485	50.2	27.2	0.2	112.5	112.0	4.5	3.2	2082
16		17	2050	1800	47.6	25.8	0.8	134.4	133.3	5.0	3.8	5353
17	49	18	2150	1800	47.0	24.2	1.7	140.4	139.0	5.2	3.9	10065
18	•	19	1750	1800	49.4	30.0	2.2	116.1	115.7	4.3	3.2	11661
19	•	20	925	1800	54.4	33.7	1.1	63.0	63.4	2.2	1.7	4299
20	•	21	875	1800	54.7	48.2	0.0	37.9	29.8	1.0	0.6	67
21	•	22	400	1800	57.6	54.6	0.0	17.5	11.9	0.4	0.3	11
22	•	23	400	1800	57.6	54.6	0.0	17.5	11.9	0.4	0.3	11
23	•	24	150	1800	59.1	58.0	0.0	6.7	4.2	0.2	0.1	2

THE	SUM OF	INBOUND	Truck	FUEL	is	13	51.5	gallons.
THE	SUM OF	INBOUND	Car	FUEL	is	142	24.1	gallons.
THE	SUM OF	INBOUND	Truck	OIL	is		36.2	quarts.
THE	SUM OF	INBOUND	Car	01L	is		49.5	quarts.
THE	SUM OF	INBOUND	WORKZO	DNE CO	STS	ISSA	45896	5 · · · ·

>>>	INBC	UND <<	<>>>	> Total	lanes:	2 Work	Zone	e Lanes: 1		
TIME	*	HRLY	* (CAPACITY	* APP	* ZN *	QUE	* E)	CESS EMISSIO	NS *
	* **	VOL.	*	INBOUND	* SPD	* SPD *	LEN	* CO	* HC	* NOX *
0 -	1	300		1800	58.2	56.0	0.0	0.1	-0.0	0.0
1 -	2	150		1800	59.1	58.0	0.0	0.1	-0.0	0.0
2 -	3	150		1800	59.1	58.0	0.0	0.1	-0.0	0.0
3 -	4	150		1800	59.1	58.0	0.0	0.1	-0.0	0.0
4 -	5	150		1800	59.1	58.0	0.0	0.1	-0.0	0.0
5 -	6	450		1800	57.3	53.9	0.0	0.2	0.0	0.0
6 -	7	1850		1800	48.8	29.2	0.1	11.6	1.1	0.2
7 -	8	2250		1800	46.4	22.5	0.8	64.1	6.3	1.4
8 -	9	1075		1800	53.5	34.8	0.8	25.7	2.3	0.5
9 -	10	850		1485	54.8	46.1	0.0	0.7	0.0	0.0
10 -	11	1000		1485	53.9	43.7	0.0	1.0	0.1	0.0
11	12	1050		1485	53.6	42.9	0.0	1.1	0.1	0.0
12 -	13	1500		1485	50.9	29.7	0.0	7.5	0.7	0.2
13	14	1225		1485	52.6	39.4	0.0	3.1	0.3	0.1
14 -	15	1325		1485	52.0	39.2	0.0	2.5	0.2	0.0
15 -	16	1625		1485	50.2	27,2	0.2	19.8	2.0	0.4
16 -	17	2050		1800	47.6	25.8	0.8	55.2	5.3	1.2
17 -	18	2150		1800	47.0	24.2	1.7	112.9	10.7	2.4
18 -	19	1750		1800	49.4	30.0	2.2	112.5	10.5	2.4
19 -	20	925		1800	54.4	33.7	1.1	29.7	2.7	0.6
20 -	21	875		1800	54.7	48.2	0.0	0.6	0.0	0.0
21 -	22	400		1800	57.6	54.6	0.0	0.2	-0.0	0.0
22 -	23	400		1800	57.6	54.6	0.0	0.2	-0.0	0.0
23 -	24	150		1800	59.1	58.0	0.0	0.1	-0.0	0.0

THE	TOTAL	EXCESS	EMISSION	OF	CARBONMONOXIDES (CO) IS	449.1	kgs.
THE	TOTAL	EXCESS	EMISSION	OF	HYDROCARBONS (HC) IS	42.3	kgs.
THE	TOTAL	EXCESS	EMISSION	OF	NITROGEN OXIDES (NOx) IS	9.6	kgs.

Echo of Input Data:

- 1. Problem Title: TEST PROBLEM 4
- 2. The major highway or freeway name is IH 35.
- 3. Free flow speed on IH 35 is 60.0 miles per hr.
- 4. Level of Service D/E speed on IH 35 is 40.0 miles per hr.
- 5. Speed in mph at capacity after queue formation on IH 35 is 30.0.
- Single direction closure workzone strategy. INBOUND direction is being considered.
- 7. Start of workzone traffic control setup is 0.
- 8. End of workzone traffic control setup is 24.
- 9. Start of actual work is 9.
- 10. End of actual work is 16.

11. Percent of 1981 dollars used to estimate current worth is 141%.

12. Idle CO emission rate for passenger cars is 293.1 gm/hr.
13. Idle CO emission rate for trucks is 51.2 gm/hr.
14. Idle HC emission rate for passenger cars is 24.3 gm/hr.
15. Idle HC emission rate for trucks is 17.4 gm/hr.
16. Idle NOx emission rate for passenger cars is 2.9 gm/hr.
17. Idle NOx emission rate for trucks is 22.3 gm/hr.
18. Total number of INBOUND lanes on IH 35 is 2 lanes.
19. Total number of OPEN INBOUND during work on IH 35 is 1 lanes.

- 24. The length in miles from beginning of taper to end of work zone is 2.0 miles.
- 25. Maximum flow per INBOUND lane before work activity on IH 35 is 2000 vehicles per hour per lane.
- 27. LOS DE breakpoint volume per INBOUND lane before work activity on IN 35 is 1650 vehicles per hour per lane.
- 29. The capacity per lane of the INBOUND work zone is 1485 vphpl.

2	>>>		INE	BOUND	~~>>>	Total	Lane	es: 2	- We	ork	Zone	Lar	nes	: 1						
	TI	M	E . 1	HRLY	*CAPAC	ITY* A	PP *	ZN 1	a	JE *	•	FUE	EL		*		01	L	*	USER
			1	VOL.	* INBO	UND* S	PD *	SPD '	' LI	EN *	CAR	*		TR	*	CAR	*	TR	*	COST
	_										· · · · ·				_		_			
	0	-	1	300	18	00 5	8.2	56.0	(0.0	26	.5		17.	5	0.	7	0.4		6
	1	•	2	150	18	00 5	9.1	58.0	(0.0	13	.5		8.	5	0.	3	0.2		2
	2	-	3	150	18	00 5	9.1	58.0	(0.0	13	.5		8.	5	0.	3	0.2		2
	3	•	4	150	18	00 5	9.1	58.0	. (0.0	13	.5		8.	5	0.	3	0.2		2
	4	-	5	150	0 18	00 5	9.1	58.0	- (0.0	13	.5		8.	5	٥.	3	0.2		2
	5	•	6	450) 18	00 5	7.3	53.9	1	0.0	39	.2	1	27.	2	1.	0	0.6		15
	6	•	7	1850	18	00 4	8.8	29.2	1	0.1	244	.5	2	43.	3	9.	0	6.8		1870
	7	•	8	2250	18	00 4	6.4	22.5) (8.0	292	.6	2	89.	3	10.	9	8.2		6789
	8	•	9	1075	5 18	00 5	3.5	34.8	(0.8	144	.7	14	45.	0	5.	2	3.9		2990
	9	-	10	850	14	85 5	4.8	46.1	- (0.0	75	.0		62.	0	1.	9	1.3		117
1	0	•	11	1000	14	85 5	3.9	43.7	. (0.0	89	.4		77.	1	2.	2	1.5		193
1	1	-	12	1050	14	85 5	3.6	42.9	1	0.0	94	.3	1	82.	3	2.	3	1.6		226
1	2	•	13	1500	14	85 5	0.9	29.7	(0.0	208	.7	20	08.	2	8.	3	5.9		1319
1	3		14	1225	5 14	85 5	2.6	39.4	- (0.0	164.	.9	10	62.	3	6.	8	4.8		412
1	4	•	15	1325	5 14	85 5	2.0	39.2	1	0.0	122	.4	1	12.	3	3.	0	2.1		472
1	5	••	16	1625	5 14	85 5	0.2	27.2	. (0.2	225	.0	2	24.	0	9.	0	6.4		2537
1	6	-	17	2050	18	00 4	7.6	25.8	- (3.8	268.	.7	20	66.	6	10.	0	7.5		5963
1	7	•	18	2150	18	00 4	7.0	24.2		1.7	280.	.7	2	78.	0	10.	4	7.9	1	0796
1	8	•	19	1750) 18	00 49	9.4	30.0	2	2.2	232.	.2	2	31.	5	8.	5	6.4	1	2038
1	9	•	20	925	5 18	00 54	4.4	33.7	_ 1	1.1	125	.9	12	26.	7	4.	5	3.4		4383
2	0	•	21	875	5 180	0 54	4.7	48.2	0	0.0	75	.8		59.	7	1.	9	1.3		82
2	1	•	22	400	180	0 57	7.6	54.6	1	0.0	35.	.0	. :	23.	9	0.	9	0.6		12
2	2	•	23	400	180	0 57	7.6	54.6	C	0.0	35.	.0	. 1	23.	9	Ο.	9	0.6		12
2	3	•	24	150	180	0 59	9.1	58.0	0	0.0	13.	.5		8.	5	0.	3	0.2		2

THE	SUM	OF	INBOUND	Truck	FUEL	is		2703.1	gallons.	
THE	SUM	OF	INBOUND	Car	FUEL	is		2848.2	gallons.	
THE	SUM	OF	INBOUND	Truck	OIL	is		72.3	quarts.	
THE	SUM	OF	INBOUND	Car	OIL	is		99.0	quarts.	
THE	SUM	OF	INBOUND	WORKZO	ONE CO	OSTS	IS	\$ 50242	2 1 1	

>>>	INBO	NUND <<	<>>> Tota	al lanes:	2 Work	Zone L	anes: 1		
TIME	*	HRLY	* CAPACIT	Y * APP 1	* ZN *	QUE *	EXCES	S EMISSIC	NS *
	***	VOL.	* INBOUN	ID * SPD *	* SPD *	LEN *	CO *	HC	* NOX *
0 -	1	300	1800	58.2	56.0	0.0	0.1	0.0	0.0
1 -	2	150	1800	59.1	58.0	0.0	0.1	-0.0	0.0
2 -	3	150	1800	59.1	58.0	0.0	0.1	-0.0	0.0
3 -	4	150	1800	59.1	58.0	0.0	0.1	-0.0	0.0
4 -	5	150	1800	59.1	58.0	0.0	0.1	-0.0	0.0
5 -	6	450	1800	57.3	53.9	0.0	0.2	0.0	0.0
6 -	7	1850	1800	48.8	29.2	0.1	13.0	1.7	0.4
7 -	8	2250	1800	46.4	22.5	0.8	68.3	7.5	1.7
8 -	9	1075	1800	53.5	34.8	0.8	25.9	2.5	0.6
9 -	10	850	1485	54.8	46.1	0.0	0.6	0.1	0.0
10 -	11	1000	1485	53.9	43.7	0.0	1.0	0.1	0.0
11 -	12	1050	1485	53.6	42.9	0.0	1.1	0.2	0.0
12 -	13	1500	1485	50.9	29.7	0.0	8.5	1.2	0.3
13 -	14	1225	1485	52.6	39.4	0.0	3.2	0.4	0.1
14 -	15	1325	1485	52.0	39.2	0.0	2.6	0.4	0.1
15 -	16	1625	1485	50.2	27.2	0.2	21.4	2.6	0.6
16 -	17	2050	1800	47.6	25.8	0.8	57.7	6.1	1.4
17 -	18	2150	1800	47.0	24.2	1.7	116.2	11.7	2.7
18 -	19	1750	1800	49.4	30.0	2.2	113.7	11.0	2.5
19 -	20	925	1800	54.4	33.7	1.1	29.9	2.8	0.6
20 -	21	875	1800	54.7	48.2	0.0	0.5	0.0	0.0
21 -	22	400	1800	57.6	54.6	0.0	0.2	0.0	0.0
22 -	23	400	1800	57.6	54.6	0.0	0.2	0.0	0.0
23 -	24	150	1800	59.1	58.0	0.0	0.1	-0.0	0.0

THE	TOTAL	EXCESS	EMISSION	OF	CARBONMONOXIDES (CO) IS	464.5 kgs.
THE	TOTAL	EXCESS	EMISSION	OF	HYDROCARBONS (HC) IS	48.5 kgs.
THE	TOTAL	EXCESS	EMISSION	OF	NITROGEN OXIDES (NOx) IS	11.1 kgs.

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Echo of Input Data:

- 1. Problem Title: TEST PROBLEM 5
- The major highway or freeway name is IH 35.
- 3. Free flow speed on IH 35 is 60.0 miles per hr.
- 4. Level of Service D/E speed on IH 35 is 40.0 miles per hr.
- 5. Speed in mph at capacity after queue formation on IH 35 is 30.0.

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- 6. Single direction closure workzone strategy. INBOUND direction is being considered.
- 7. Start of workzone traffic control setup is 8.
- 8. End of workzone traffic control setup is 17.
- 9. Start of actual work is 9.
- 10. End of actual work is 16.

11. Percent of 1981 dollars used to estimate current worth is 141%.

12. Idle CO emission rate for passenger cars is 293.1 gm/hr.
13. Idle CO emission rate for trucks is 51.2 gm/hr.
14. Idle HC emission rate for passenger cars is 24.3 gm/hr.
15. Idle HC emission rate for trucks is 17.4 gm/hr.
16. Idle NOx emission rate for passenger cars is 2.9 gm/hr.
17. Idle NOx emission rate for trucks is 22.3 gm/hr.
18. Total number of INBOUND lanes on IH 35 is 3 lanes.
19. Total number of OPEN INBOUND during work on IH 35 is 2 lanes.

- 24. The length in miles from beginning of taper to end of work zone is 1.0 miles.
- 25. Maximum flow per INBOUND lane before work activity on IH 35 is 2000 vehicles per hour per lane.
- 27. LOS DE breakpoint volume per INBOUND lane before work activity on IN 35 is 1650 vehicles per hour per lane.
- 29. The capacity per lane of the INBOUND work zone is 1485 vphpl.

>>>	INB	OUND <	<>>> Tota	al Lan	es: 3	Work	Zone L	anes: 2			
TIM	E *	HRLY *	CAPACITY*	APP *	ZN 1	* QUE *	F	UEL	*	OIL	* USER
	*	VOL. *	INBOUND*	SPD *	SPD	LEN *	CAR	* TR	* CAR	* TR	* COST
0 -	1	300	6000	58.8							
1 -	2	150	6000	59.4							
2 -	3	150	6000	59.4							
3 -	4	150	6000	59.4							
4 -	5	150	6000	59.4							
5 -	6	450	6000	58.2							
6 -	7	1850	6000	52.5							
7 -	8	2250	6000	50.9							
8 -	9	1075	3600	55.7	52.8	0.0	46.0	32.4	1.2	0.8	34
9 -	10	850	2970	56.6	53.1	0.0	36.8	25.9	0.9	0.6	29
10 -	11	1000	2970	56.0	51.8	0.0	43.1	31.3	1.1	0.7	42
11 -	12	1050	2970	55.8	51.4	0.0	45.2	33.1	1.2	0.8	47
12 -	13	1500	2970	53.9	47.8	0.0	64.6	51.1	1.6	1.1	118
13 -	14	1225	2970	55.1	50.0	0.0	52.6	39.8	1.3	0.9	69
14 -	15	1325	2970	54.6	49.2	0.0	57.0	43.8	1.5	1.0	85
15 -	16	1625	2970	53.4	46.7	0.0	70.2	56.6	1.8	1.2	148
16 -	17	2050	3600	51.7	46.2	0.0	87.2	70.1	2.2	1.5	181
17 -	18	2150	6000	51.3							
18 -	19	1750	6000	52.9							
19 -	20	925	6000	56.3							
20 -	21	875	6000	56.5							
21 -	22	400	6000	58.4							
22 -	23	400	6000	58.4							
23 -	24	150	6000	59.4							
THE S	UM (OF INBO	OUND Truck	FUEL	is	384	.0 gal	lons.			

THE	SUM OF	INBOUND	Truck	FUEL	15	-	584.0	gallons.
THE	SUM OF	INBOUND	Car	FUEL	is	5	502.6	gallons.
THE	SUM OF	INBOUND	Truck	011	is		8.5	quarts.
THE	SUM OF	INBOUND	Car	OIL	is		12.8	quarts.
THE	SUM OF	INBOUND	WORKZO	DNE CO	ISTS	IS \$	755	

>>>	INBO	UND <<	<>>>	Total	lanes:	3	Wo	rk	Zone	Lan	es:	2				
TIME	*	HRLY	* C	APACITY	* APP	*	ZN	*	QUE	*		EXCESS	EMISS	SIONS		*
	*	VOL.	*	INBOUND	* SPD	*	SPD	*	LEN	a	co	*	HC	*	NOX	*
0 -	1	300		6000	58.8											
1 -	2	150		6000	59.4											
2 -	3	150		6000	59.4											
3 -	4	150		6000	59.4											
4 -	5	150		6000	59.4											
5 -	6	450		6000	58.2											
6 -	7	1850		6000	52.5											
7 -	8	2250		6000	50.9											
8 -	9	1075		3600	55.7		52.8		0.0		0.	.5	0.0		0.0	
9 -	10	850		2970	56.6		53.1		0.0		0.	.4	0.0		0.0	
10 -	11	1000		2970	56.0		51.8		0.0		0.	.5	0.0		0.0	
11 -	12	1050		2970	55.8		51.4		0.0		0.	.6	0.0		0.0	
12 -	13	1500		2970	53.9		47.8		0.0		0.	.9	0.0		0.0	
13 -	14	1225		2970	55.1		50.0		0.0		0.	.7	0.0		0.0	
14 -	15	1325		2970	54.6		49.2		0.0		0.	.8	0.0		0.0	
15 -	16	1625		2970	53.4	٠,	46.7		0.0		1.	1	0.0		0.0	
16 -	17	2050		3600	51.7		46.2		0.0		1.	.3	0.0		0.0	
17 -	18	2150		6000	51.3											
18 -	19	1750		6000	52.9											
19 -	20	925		6000	56.3											
20 -	21	875		6000	56.5											
21 -	22	400		6000	58.4											
22 -	23	400		6000	58.4											
23 -	24	150		6000	59.4											

THE	TOTAL	EXCESS	EMISSION	OF	CARBONMONOXIDES (CO) IS	6.7	kgs.
THE	TOTAL	EXCESS	EMISSION	OF	HYDROCARBONS (HC) IS	0.2	kgs.
THE	TOTAL	EXCESS	EMISSION	OF	NITROGEN OXIDES (NOx) IS	0.0	kgs.

Echo of Input Data:

- 1. Problem Title: TEST PROBLEM 6
- 2. The major highway or freeway name is IH 35.
- 3. Free flow speed on IH 35 is 60.0 miles per hr.
- 4. Level of Service D/E speed on IH 35 is 40.0 miles per hr.
- 5. Speed in mph at capacity after queue formation on IH 35 is 30.0.
- Single direction closure workzone strategy. / INBOUND direction is being considered.

7. Start of workzone traffic control setup is 8.

8. End of workzone traffic control setup is 17.

- 9. Start of actual work is 9.
- 10. End of actual work is 16.

11. Percent of 1981 dollars used to estimate current worth is 141%.

12. Idle CO emission rate for passenger cars is 293.1 gm/hr.
13. Idle CO emission rate for trucks is 51.2 gm/hr.
14. Idle HC emission rate for passenger cars is 24.3 gm/hr.
15. Idle HC emission rate for trucks is 17.4 gm/hr.
16. Idle NOx emission rate for passenger cars is 2.9 gm/hr.
17. Idle NOx emission rate for trucks is 22.3 gm/hr.
18. Total number of INBOUND lanes on IH 35 is 3 lanes.
19. Total number of OPEN INBOUND during work on IH 35 is 2 lanes.

- 24. The length in miles from beginning of taper to end of work zone is 2.0 miles.
- 25. Maximum flow per INBOUND lane before work activity on IH 35 is 2000 vehicles per hour per lane.
- 27. LOS DE breakpoint volume per INBOUND lane before work activity on IH 35 is 1650 vehicles per hour per lane.
- 29. The capacity per lane of the INBOUND work zone is 1485 vphpl.

TIME * HRLY *CAPACITY* APP * ZN * QUE * FUEL * OIL * USEF * VOL. * INBOUND* SPD * SPD * LEN * CAR * TR * CAR * TR * CAR * TR * COS* 0 - 1 300 6000 58.8 1 - 2 150 6000 59.4 2 - 3 150 6000 59.4 3 - 4 150 6000 59.4 4 - 5 150 6000 59.4 5 - 6 450 6000 59.2 6 - 7 1850 6000 53.2	
* VOL. * INBOUND* SPD * SPD * LEN * CAR * TR * CAR * TR * COS 0 - 1 300 6000 58.8 1 - 2 150 6000 59.4 2 - 3 150 6000 59.4 3 - 4 150 6000 59.4 4 - 5 150 6000 59.4 5 - 6 450 6000 59.2 5 - 6 450 6000 53.2	R
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2 - 3 150 6000 59.4 3 - 4 150 6000 59.4 4 - 5 150 6000 59.4 5 - 6 450 6000 58.2 6 - 7 1850 6000 53.5	
3 - 4 150 6000 59.4 4 - 5 150 6000 59.4 5 - 6 450 6000 58.2 6 - 7 1850 6000 53.5	
4 - 5 150 6000 59.4 5 - 6 450 6000 58.2 6 - 7 1850 6000 52.5	
5 - 6 450 6000 58.2 6 - 7 1850 6000 52.5	
6 7 1850 6000 52 5	
7 - 8 2250 6000 50.9	
8 - 9 1075 3600 55.7 52.8 0.0 92.0 64.8 2.4 1.5 38	8
9 - 10 850 2970 56.6 53.1 0.0 73.5 51.9 1.9 1.2 32	2
10 - 11 1000 2970 56.0 51.8 0.0 86.2 62.5 2.2 1.4 48	B
11 - 12 1050 2970 55.8 51.4 0.0 90.4 66.2 2.3 1.5 54	4
12 - 13 1500 2970 53.9 47.8 0.0 129.2 102.2 3.3 2.2 144	4
13 - 14 1225 2970 55.1 50.0 0.0 105.3 79.5 2.7 1.8 81	1
14 - 15 1325 2970 54.6 49.2 0.0 113.9 87.5 2.9 1.9 101	1
15 - 16 1625 2970 53.4 46.7 0.0 140.3 113.1 3.6 2.4 182	2
16 - 17 2050 3600 51.7 46.2 0.0 174.4 140.3 4.5 3.0 220	5
17 - 18 2150 6000 51.3	
18 - 19 1750 6000 52.9	
19 - 20 925 6000 56.3	
20 - 21 875 6000 56.5	
21 - 22 400 6000 58-4	
22 - 23 400 6000 58.4	
23 - 24 150 6000 59 4	. 7

THE	SUM	OF	INBOUND	Truck	FUEL	15		768.0	gallons.
THE	SUM	OF	INBOUND	Car	FUEL	is		1005.2	gallons.
THE	SUM	OF	INBOUND	Truck.	OIL	is		17.1	quarts.
THE	SUM	OF	INBOUND	Car	01L	is		25.7	quarts.
THE	SUM	OF	INBOUND	WORKZO	NE CO	OSTS	IS	\$ 901	

>>>	INBO	-> DANC	<>>> Total	lanes:	3 Work	Zone Lar	nes: 2		
TIM	E *	HRLY	* CAPACITY	* APP	* ZN *	QUE *	EXCESS	EMISSIONS	*
	*	VOL.	* INBOUND	* SPD	* SPD *	LEN *	CO *	HC *	NOX *
0		700	6000	E0 0					
	· ·	150	6000	50.0					
1.	2	150	6000	59.4					
2 -	5	150	6000	59.4					
-3 -	4	150	6000	59.4					
4 -	5	150	6000	59.4					
5 -	6	450	6000	58.2					
6 -	7	1850	6000	52.5					
7 -	8	2250	6000	50.9					
8 -	9	1075	3600	55.7	52.8	0.0	0.5	0.0	0.0
9 -	10	850	2970	56.6	53.1	0.0	0.4	0.0	0.0
10 -	11	1000	2970	56.0	51.8	0.0	0.5	0.0	0.0
11 -	12	1050	2970	55.8	51.4	0.0	0.5	0.0	0.0
12 -	13	1500	2970	53.9	47.8	0.0	0.9	0.1	0.0
13 -	14	1225	2970	55.1	50.0	0.0	0.6	0.0	0.0
14 -	15	1325	2970	54.6	49.2	0.0	0.7	0.0	0.0
15 -	16	1625	2970	53.4	46.7	0.0	1.0	0.1	0.0
16 -	17	2050	3600	51.7	46.2	0.0	1.2	0.1	0.0
17 -	18	2150	6000	51.3					
18 -	19	1750	6000	52.9					
19 -	20	925	6000	56.3					
20 -	21	875	6000	56.5					
21 -	22	400	6000	58.4					
22 -	23	400	6000	58 /					
22 -	24	150	4000	50.4					
23 °	64	150	8000	37.4					

THE	TOTAL	EXCESS	EMISSION	OF	CARBONMONOXIDES (CO) IS	6.4	kgs.
THE	TOTAL	EXCESS	EMISSION	OF	HYDROCARBONS (HC) IS	0.4	kgs.
THE	TOTAL	EXCESS	EMISSION	OF	NITROGEN OXIDES (NOX) IS	0.1	kgs.

Echo of Input Data:

- 1. Problem Title: TEST PROBLEM 7
- 2. The major highway or freeway name is IH 35.
- 3. Free flow speed on 1H 35 is 60.0 miles per hr.
- 4. Level of Service D/E speed on IH 35 is 40.0 miles per hr.
- 5. Speed in mph at capacity after queue formation on IH 35 is 30.0.
- 6. Single direction closure workzone strategy. INBOUND direction is being considered.
- 7. Start of workzone traffic control setup is 8.
- 8. End of workzone traffic control setup is 17.
- 9. Start of actual work is 9.
- 10. End of actual work is 16.

11. Percent of 1981 dollars used to estimate current worth is 141%.

12.	Idle CO	emission	rate for	passenger	cars is	293.1	gm/hr.
13.	Idle CO	emission	rate for	trucks is		51.2	gm/hr.
14.	Idle HC	emission	rate for	passenger	cars is	24.3	gm/hr.
15.	Idle HC	emission	rate for	trucks is		17.4	gm/hr.
16.	Idle NOx	emission	rate fo	r passengei	r cars is	2.9	gm/hr.
17.	Idle NOx	emission	rate for	r trucks is	S	22.3	gm/hr.
18.	Total nur	mber of I	NBOUND La	anes on IH	35 is 3	lanes.	
19.	Total nur	mber of 0	PEN INBO	UND during	work on	IH 35 is	1 lanes

- 24. The length in miles from beginning of taper to end of work zone is 1.0 miles.
- 25. Maximum flow per INBOUND lane before work activity on IH 35 is 2000 vehicles per hour per lane.
- 27. LOS DE breakpoint volume per INBOUND lane before work activity on IH 35 is 1650 vehicles per hour per lane.
- 29. The capacity per lane of the INBOUND work zone is 1250 vphpl.
| >>> INB | OUND <<<> | >> Tota | al Lan | es: 3 | Work 2 | Zone Lar | nes: 1 | | | |
|---------|-----------|---------|--------|---------|---------|----------|--------|-------|-----|--------|
| TIME * | HRLY *CA | PACITY* | APP * | ZN * | QUE * | FUE | L * | 01 | L | * USER |
| * | VOL. * 1 | NBOUND* | SPD * | SPD * | LEN * | CAR * | TR T | CAR = | TR | * COST |
| 0 - 1 | 300 | 6000 | 58.8 | | | | | | | |
| 1 - 2 | 150 | 6000 | 59.4 | | | | | | | |
| 2 - 3 | 150 | 6000 | 59.4 | | | | | | | |
| 3 - 4 | 150 | 6000 | 59.4 | | | | | | | |
| 4 - 5 | 150 | 6000 | 59.4 | | | | | | | |
| 5 - 6 | 450 | 6000 | 58.2 | | | | | | | |
| 6 - 7 | 1850 | 6000 | 52.5 | | | | | | | |
| 7 - 8 | 2250 | 6000 | 50.9 | | | | | | | |
| 8 - 9 | 1075 | 1800 | 55.7 | 45.5 | 0.0 | 48.2 | 40.6 | 1.2 | 0.8 | 135 |
| 9 - 10 | 850 | 1250 | 56.6 | 43.5 | 0.0 | 39.2 | 34.6 | 0.9 | 0.7 | 145 |
| 10 - 11 | 1000 | 1250 | 56.0 | 40.6 | 0.0 | 47.2 | 43.3 | 1.1 | 0.8 | 239 |
| 11 - 12 | 1050 | 1250 | 55.8 | 40.0 | 0.0 | 49.9 | 46.3 | 1.2 | 0.8 | 275 |
| 12 - 13 | 1500 | 1250 | 53.9 | 24.0 | 0.3 | 114.8 | 114.5 | 6.0 | 3.3 | 2976 |
| 13 - 14 | 1225 | 1250 | 55.1 | 30.0 | 0.5 | 94.5 | 94.5 | 4.9 | 2.7 | 4206 |
| 14 - 15 | 1325 | 1250 | 54.6 | 28.2 | 0.5 | 101.9 | 101.8 | 5.3 | 3.0 | 4696 |
| 15 - 16 | 1625 | 1250 | 53.4 | 21.0 | 1.0 | 124.0 | 123.5 | 6.5 | 3.6 | 8648 |
| 16 - 17 | 2050 | 1800 | 51.7 | 25.8 | 1.6 | 148.3 | 147.7 | 6.5 | 4.3 | 13308 |
| 17 - 18 | 2150 | 6000 | 51.3 | 46.2 | 1.0 | 93.1 | 86.0 | 2.6 | 2.0 | 1820 |
| 18 - 19 | 1750 | 6000 | 52.9 | | | | | | | |
| 19 - 20 | 925 | 6000 | 56.3 | | | | | | | |
| 20 - 21 | 875 | 6000 | 56.5 | | | | | | | |
| 21 - 22 | 400 | 6000 | 58.4 | | | | | | | |
| 22 - 23 | 400 | 6000 | 58.4 | | | | | | | |
| 23 - 24 | 150 | 6000 | 59.4 | | | | | | | |
| | | | | | | | | | | |
| THE CHM | | ND Tour | | ie | 977 | 6 00110 | | | | |
| THE CUM | | | ENEL | is | 941 | 1 gallo | ns. | | | |
| THE SIM | | | PUEL | ie | 22 | n gaile | | | | |
| THE SUM | | ND Car | | ie | 74 | | | | | |
| THE SUM | | ND LOPY | | 13 | 30.
 | | э. | | | |
| THE JUN | 1 1000 | NO WORK | | 0010 10 | | | | | | |

TIME * HRLY * CAPACITY * APP * ZN * QUE * EXCESS EMISSIONS * 0 - 1 300 6000 58.8 CO * HC * NOX * 1 - 2 150 6000 59.4 CO * HC * NOX * 2 - 3 150 6000 59.4 - - - - - - NOX * 3 - 4 150 6000 59.4 -	>>>		INBO	UND <<	<>>>	Total	lanes	: 3	Wo	rk	Zone	Lar	nes: 1					
* VOL. * INBOUND * SPD * SPD * LEN * CO * HC * NOX * 0 - 1 300 6000 58.8 - - - - NOX * * 2 - 3 150 6000 59.4 -	TIM	ſΕ	*	HRLY	* C.	APACITY	* APP	*	ZN	*	QUE	*	E	XCESS	EMISS	IONS		*
$\begin{array}{cccccccccccccccccccccccccccccccccccc$			*	VOL.	* .	INBOUND	* SPD	*	SPD	*	LEN	*	CO	*	HC	*	NOX	*
$\begin{array}{cccccccccccccccccccccccccccccccccccc$																		
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	0 -	•	1	300		6000	58.8											
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	1 -	•	2	150		6000	59.4											
3 - 4150600059.4 $4 - 5$ 150600059.4 $5 - 6$ 450600058.2 $6 - 7$ 1850600052.5 $7 - 8$ 2250600050.9 $8 - 9$ 1075180055.745.50.01.00.10.0 $9 - 10$ 850125056.643.50.01.00.10.0 $10 - 11$ 1000125056.040.60.01.60.10.0 $11 - 12$ 1050125055.840.00.01.90.20.0 $12 - 13$ 1500125055.730.00.548.64.51.0 $14 - 125$ 125055.130.00.557.75.41.2 $15 - 16$ 1625125053.421.01.0127.812.22.8 $16 - 17$ 2050180051.725.81.6167.915.73.6 $17 - 18$ 2150600051.346.21.06.30.70.1 $18 - 19$ 1750600052.91920925600056.51.2 $21 - 22$ 400600058.42223400600058.42324150600059.4	2 -	•	3	150		6000	59.4											
$ \begin{array}{cccccccccccccccccccccccccccccccccccc$	3 -	۰.	4	150		6000	59.4											
$ \begin{array}{cccccccccccccccccccccccccccccccccccc$	4 -	•	5	150		6000	59.4											
6 - 71850 6000 52.5 $7 - 8$ 2250 6000 50.9 $8 - 9$ 10751800 55.7 45.5 0.0 1.0 0.1 0.0 $9 - 10$ 8501250 56.6 43.5 0.0 1.0 0.1 0.0 $10 - 11$ 10001250 56.6 40.6 0.0 1.6 0.1 0.0 $11 - 12$ 10501250 55.8 40.0 0.0 1.9 0.2 0.0 $12 - 13$ 15001250 53.9 24.0 0.3 35.6 3.6 0.8 $13 - 14$ 12251250 55.1 30.0 0.5 48.6 4.5 1.0 $14 - 15$ 13251250 54.6 28.2 0.5 57.7 5.4 1.2 $15 - 16$ 16251250 53.4 21.0 1.0 127.8 12.2 2.8 $16 - 17$ 20501800 51.7 25.8 1.6 167.9 15.7 3.6 $17 - 18$ 2150 6000 51.3 46.2 1.0 6.3 0.7 0.1 $18 - 19$ 1750 6000 52.9 1.0 6.3 0.7 0.1 $19 - 20$ 925 6000 56.5 1.2 1.2 1.2 1.2 $21 - 22$ 400 6000 58.4 $22 - 23$ 400 6000 58.4 $22 - 23$ 400 6000 58.4 $23 - 24$ 150 6000 59	5 -	•	6	450		6000	58.2											
7 - 8 2250 6000 50.9 $8 - 9$ 1075 1800 55.7 45.5 0.0 1.0 0.1 0.0 $9 - 10$ 850 1250 56.6 43.5 0.0 1.0 0.1 0.0 $10 - 11$ 1000 1250 56.6 43.5 0.0 1.6 0.1 0.0 $11 - 12$ 1050 1250 55.8 40.0 0.0 1.9 0.2 0.0 $12 - 13$ 1500 1250 55.8 40.0 0.3 35.6 3.6 0.8 $13 - 14$ 1225 1250 55.1 30.0 0.5 48.6 4.5 1.0 $14 - 15$ 1325 1250 55.1 30.0 0.5 48.6 4.5 1.0 $14 - 15$ 1325 1250 55.4 21.0 1.0 127.8 12.2 2.8 $16 - 17$ 2050 1800 51.7 25.8 1.6 167.9 15.7 3.6 $17 - 18$ 2150 6000 51.3 46.2 1.0 6.3 0.7 0.1 $18 - 19$ 1750 6000 52.9 1.0 6.3 0.7 0.1 $19 - 220$ 925 6000 56.5 21 22 400 6000 58.4 $22 - 23$ 400 6000 58.4 22 23 400 6000 58.4 $23 - 24$ 150 6000 59.4 150 120 120 120 <td>6 -</td> <td></td> <td>7</td> <td>1850</td> <td></td> <td>6000</td> <td>52.5</td> <td></td>	6 -		7	1850		6000	52.5											
8 - 910751800 55.7 45.5 0.0 1.0 0.1 0.0 $9 - 10$ 8501250 56.6 43.5 0.0 1.0 0.1 0.0 $10 - 11$ 10001250 56.6 40.6 0.0 1.6 0.1 0.0 $11 - 12$ 10501250 55.8 40.0 0.0 1.9 0.2 0.0 $12 - 13$ 15001250 53.9 24.0 0.3 35.6 3.6 0.8 $13 - 14$ 12251250 55.1 30.0 0.5 48.6 4.5 1.0 $14 - 15$ 13251250 54.6 28.2 0.5 57.7 5.4 1.2 $15 - 16$ 16251250 53.4 21.0 1.0 127.8 12.2 2.8 $16 - 17$ 20501800 51.7 25.8 1.6 167.9 15.7 3.6 $17 - 18$ 2150 6000 51.3 46.2 1.0 6.3 0.7 0.1 $18 - 19$ 1750 6000 52.9 1.0 6.3 0.7 0.1 $19 - 20$ 925 6000 56.5 21 22 400 6000 58.4 $22 - 23$ 400 6000 58.4 22 23 400 6000 59.4	7 -		8	2250		6000	50.9											
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	8 -		9	1075		1800	55.7	4	\$5.5		0.0		1.0		0.1		0.0	
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	9 -		10	850		1250	56.6		43.5		0.0		1.0		0.1		0.0	
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	10 -		11	1000		1250	56.0	1	40.6		0.0		1.6		0.1		0.0	
$ \begin{array}{cccccccccccccccccccccccccccccccccccc$	11 -	1	12	1050		1250	55.8	1	6.0		0.0		1.9		0.2		0.0	
$ \begin{array}{cccccccccccccccccccccccccccccccccccc$	12 -		13	1500		1250	53.9	2	24.0		0.3		35.6		3.6		0.8	
$ \begin{array}{cccccccccccccccccccccccccccccccccccc$	13 -		14	1225		1250	55.1	- 3	50.0		0.5		48.6		4.5		1.0	
$ \begin{array}{cccccccccccccccccccccccccccccccccccc$	14 -		15	1325		1250	54.6		28.2		0.5		57.7		5.4		1.2	
$ \begin{array}{ccccccccccccccccccccccccccccccc$	15 -		16	1625		1250	53.4		21.0		1.0		127.8		12.2		2.8	
17 - 18 2150 6000 51.3 46.2 1.0 6.3 0.7 0.1 18 - 19 1750 6000 52.9 56.3 56.3 56.5	16 -		17	2050		1800	51.7		25.8		1.6		167.9		15.7		3.6	
18 - 19 1750 6000 52.9 19 - 20 925 6000 56.3 20 - 21 875 6000 56.5 21 - 22 400 6000 58.4 22 - 23 400 6000 58.4 23 - 24 150 6000 59.4	17 -		18	2150		6000	51.3	1	6.2		1.0		6.3		0.7		0.1	
19 - 20 925 6000 56.3 20 - 21 875 6000 56.5 21 - 22 400 6000 58.4 22 - 23 400 6000 58.4 23 - 24 150 6000 59.4	18 -		19	1750		6000	52.9											
20 - 21 875 6000 56.5 21 - 22 400 6000 58.4 22 - 23 400 6000 58.4 23 - 24 150 6000 59.4	19 -	2	20	925		6000	56.3											
21 - 22 400 6000 58.4 22 - 23 400 6000 58.4 23 - 24 150 6000 59.4	20 -	2	21	875		6000	56.5											
22 - 23 400 6000 58.4 23 - 24 150 6000 59.4	21 -	2	22	400		6000	58.4											
23 - 24 150 6000 59.4	22 -	2	23	400		6000	58.4											
	23 -	2	24	150		6000	59.4											

THE	TOTAL	EXCESS	EMISSION	OF	CARBONMONOXIDES (CO) IS	449.2	kgs.
THE	TOTAL	EXCESS	EMISSION	OF	HYDROCARBONS (HC) IS	42.6	kgs.
THE	TOTAL	EXCESS	EMISSION	OF	NITROGEN OXIDES (NOx) IS	9.7	kgs.

Texas Department of Highways and Public Transportation - Q U E W Z - 8 5 v 1.0

Echo of Input Data:

- 1. Problem Title: TEST PROBLEM 8
- 2. The major highway or freeway name is IH 35.
- 3. Free flow speed on IH 35 is 60.0 miles per hr.
- 4. Level of Service D/E speed on IH 35 is 40.0 miles per hr.
- 5. Speed in mph at capacity after queue formation on IH 35 is 30.0.
- 6. Single direction closure workzone strategy. INBOUND direction is being considered.
- 7. Start of workzone traffic control setup is 8.
- 8. End of workzone traffic control setup is 17.
- 9. Start of actual work is 9.
- 10. End of actual work is 16.

11. Percent of 1981 dollars used to estimate current worth is 141%.

12. Idle CO emission rate for passenger cars is 293.1 gm/hr.
13. Idle CO emission rate for trucks is 51.2 gm/hr.
14. Idle HC emission rate for passenger cars is 24.3 gm/hr.
15. Idle HC emission rate for trucks is 17.4 gm/hr.
16. Idle NOx emission rate for passenger cars is 2.9 gm/hr.
17. Idle NOx emission rate for trucks is 22.3 gm/hr.
18. Total number of INBOUND lanes on IH 35 is 3 lanes.
19. Total number of OPEN INBOUND during work on IH 35 is 1 lanes.

22. Percent INBOUND trucks on IH 35 is 13.0%

- 24. The length in miles from beginning of taper to end of work zone is 2.0 miles.
- 25. Maximum flow per INBOUND lane before work activity on IH 35 is 2000 vehicles per hour per lane.
- 27. LOS DE breakpoint volume per INBOUND lane before work activity on IH 35 is 1650 vehicles per hour per lane.
- 29. The capacity per lane of the INBOUND work zone is 1250 vphpl.

>>> INBOUND <<<>>> Tot	al Lanes: 3	Work Zone l	anes: 1			
TIME * HRLY *CAPACITY*	APP * ZN *	QUE *	FUEL *	OI	L	* USER
* VOL. * INBOUND*	SPD * SPD *	LEN * CAR	* TR *	CAR *	TR	* COST
0 - 1 300 6000	58.8					
1 - 2 150 6000	59.4					
2 - 3 150 6000	59.4					
3 - 4 150 6000	59.4					
4 - 5 150 6000	59.4					
5 - 6 450 - 6000	58.2					
6 - 7 1850 6000	52.5					
7 - 8 2250 6000	50.9					
8 - 9 1075 1800	55.7 45.5	0.0 96.3	8 81.2	2.4	1.6	170
9 - 10 850 1250	56.6 43.5	0.0 78.5	69.1	1.9	1.3	188
10 - 11 1000 1250	56.0 40.6	0.0 94.5	5 86.7	2.2	1.6	318
11 - 12 1050 1250	55.8 40.0	0.0 99.9	92.5	2.4	1.7	367
12 - 13 1500 1250	53.9 24.0	0.3 229.6	229.0	12.1	6.7	3551
13 - 14 1225 1250	55.1 30.0	0.5 188.9	188.9	9.9	5.5	4503
14 - 15 1325 1250	54.6 28.2	0.5 203.8	203.6	10.7	5.9	5065
15 - 16 1625 1250	53.4 21.0	1.0 247.9	246.9	13.1	7.2	9436
16 - 17 2050 1800	51.7 25.8	1.6 296.5	295.4	13.1	8.5	13967
17 - 18 2150 6000	51.3 46.2	1.0 186.3	171.9	5.2	3.9	1844
18 - 19 1750 6000	52.9					
19 - 20 925 6000	56.3					
20 - 21 875 6000	56.5					
21 ~ 22 400 6000	58.4					
22 - 23 400 6000	58.4					
23 - 24 150 6000	59.4					
THE SUM OF INBOUND Truc	k FUEL is	1665.2 gal	lons.			
THE SUM OF INBOUND Car	FUEL is	1722.2 gal	lons.			
THE SUM OF INBOUND Truc	k OIL is	43.9 qua	rts.			
THE SUM OF INBOUND Car	OIL is	72.8 qua	rts.			

>>>	INBO	UND <<	<>>> Total	lanes: 3	Work	Zone	Lanes: 1		
TIME	*	HRLY	* CAPACITY	* APP *	ZN *	QUE *	EXCE	SS EMISSIONS	*
	*	VOL .	* INBOUND	* SPD *	SPD *	LEN *	C0 *	HC *	NOX *
0 -	1	300	6000	58.8					
1 -	2	150	6000	59.4					
2 -	3	150	6000	59.4					
3 -	4	150	6000	59.4					
4 -	5	150	6000	59.4					
5 -	6	450	6000	58.2					
6 -	7	1850	6000	52.5					
7 -	8	2250	6000	50.9					
8 -	9	1075	1800	55.7	45.5	0.0	0.9	0.1	0.0
9 -	10	850	1250	56.6	43.5	0.0	0.9	0.1	0.0
10 -	11	1000	1250	56.0	40.6	0.0	1.6	0.3	0.1
11 -	12	1050	1250	55.8	40.0	0.0	1.9	0.3	0.1
12 -	13	1500	1250	53.9	24.0	0.3	37.8	4.4	1.0
13 -	14	1225	1250	55.1	30.0	0.5	49.3	5.0	1.1
14 -	15	1325	1250	54.6	28.2	0.5	58.8	6.0	1.4
15 -	16	1625	1250	53.4	21.0	1.0	131.4	13.3	3.1
16 -	17	2050	1800	51.7	25.8	1.6	170.3	16.7	3.8
17 -	18	2150	6000	51.3	46.2	1.0	6.3	0.7	0.1
18 -	19	1750	6000	52.9					
19 -	20	925	6000	56.3					
20 -	21	875	6000	56.5					
21 -	22	400	6000	58.4					
22 -	23	400	6000	58.4					
23 -	24	150	6000	59.4					

THE	TOTAL	EXCESS	EMISSION	OF	CARBONMONOXIDES (CO) IS	459.1 kgs.
THE	TOTAL	EXCESS	EMISSION	OF	HYDROCARBONS (HC) IS	46.9 kgs.
THE	TOTAL	EXCESS	EMISSION	OF	NITROGEN OXIDES (NOX) IS	10.8 kgs.