Technical Appendix
LAX Master Plan EIS/EIR

G. Air Quality Impact Analysis

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List of Acronyms

AAM – annual arithmetic mean

ACU – air conditioning unit

ADT – average daily trip

AGM – annual geometric mean

APU – auxiliary power unit

AQMP – Air Quality Management Plan

ASU – air start unit

AvGas – aviation gasoline

AVR – average vehicle ridership

BACT – best available control technology

bhp – brake horsepower

CAAQS – California Ambient Air Quality Standard

CAL3QHCR – Model for dispersion of CO from motor vehicles at roadway intersections

CALINE – California Line Source Model

CALMPRO – Calms Processing Model

Caltrans – California Department of Transportation

CARB – California Air Resources Board

CDM – Camp Dresser & McKee Inc.

CEQA – California Environmental Quality Act

CFR – Code of Federal Regulations

CNG – compressed natural gas

CO – carbon monoxide

CT – cooling tower

CTA – Central Terminal Area

CUP – Central Utility Plant

EDMS – Emissions and Dispersion Modeling System

EIR – Environmental Impact Report

EIS – Environmental Impact Statement

EMFAC – California Emission Factor Model

FAA – Federal Aviation Administration

FAEED – FAA Aircraft Engine Emission Database

FR – Federal Register

g - gram

GAV – ground access vehicles

GPU – ground power unit

GRE – ground run-up enclosure

GSE – ground support equipment

GVW – gross vehicle weight

HAP – hazardous air pollutant

HC – hydrocarbon

HHDT – heavy heavy diesel truck

ICAO – International Civil Aviation Organization

ISCST – Industrial Source Complex Short Term Model

kg – kilogram

LADWP – Los Angeles Department of Water and Power

LAWA – Los Angeles World Airports

LAX – Los Angeles International Airport

LDA – light duty automobile

LDT – light duty truck

LEV – low emission vehicle

LHGT – light heavy gasoline truck

LNG – liquified natural gas

LTO – landing and takeoff operation

m - meter

MCY - motorcycle

MDT – medium duty truck

$\mu g/m^3$ – microgram per cubic meter

MHDT – medium heavy diesel truck

MHGT – medium heavy gasoline truck

mmBtu – millions of British thermal units

MVEI – California Motor Vehicle Emissions Inventory Model

NAAQS – National Ambient Air Quality Standard

NA / NP – No Action / No Project Alternative

NEPA – National Environmental Policy Act

NO_2 – nitrogen dioxide

NO_x – nitrogen oxides

O_3 – ozone

OEHHA – California Office of Environmental Health Hazard Assessment

PAH – polynuclear aromatic hydrocarbon

Pb - lead

$PM_{2.5}$ – particulate matter with an equivalent aerodynamic diameter of 2.5 micrometers or less

PM_{10} – particulate matter with an equivalent aerodynamic diameter of 10 micrometers or less

ppm – parts per million

REL – reference exposure level

ROG – reactive organic gas

SCAQMD – South Coast Air Quality Management District

SIMMOD – Simulation Model

SIP – state implementation plan

SO_2 – sulfur dioxide

SO_x – sulfur oxides

SULEV – super ultra low emission vehicle

SUV – sport utility vehicle

TAC – toxic air contaminant

TAPA – toxic air pollutant assessment

TCDD – tetrachloro-dibenzo-p-dioxin

TIM – time in mode

UBD – urban bus diesel

USEPA – United States Environmental Protection Agency

V/C – volume-to-capacity ratio

VFR – visual flight rules

VMT – vehicle miles traveled

VOC – volatile organic compounds

WTA – West Terminal Area

ZEV – zero emission vehicle

1. INTRODUCTION

With or without implementation of the proposed LAX Master Plan, the amount of air traffic, surface traffic, and airport activities would increase at LAX as compared to the environmental baseline. As a consequence of the increase in airport activities, emissions of criteria air pollutants from mobile, stationary, and area sources associated with LAX are expected to increase. However, implementation of the proposed LAX Master Plan provides unparalleled opportunities to mitigate those increases. A quantitative air quality assessment was conducted to estimate criteria pollutant mass emissions for the environmental baseline and for each alternative, and to predict the associated ambient concentrations. This Technical Appendix is provided in support of Section 4.6, *Air Quality*, of the Draft EIS/EIR. It evaluates emissions from, and potential impacts to, on-airport and off-airport air quality during construction and operation.

2. METHODOLOGY

The following sections discuss and identify the categories and types of emission sources inventoried, the calculation procedures and sources of data used to complete the emissions inventories, and the assumptions for dispersion modeling. These sections describe the approach for developing the emissions inventories and for conducting the dispersion modeling analyses for the alternatives for two planning horizons: 2005 and 2015. The year 2015 represents build out of the LAX Master Plan. Interim year emissions inventories and estimates of ambient concentrations were also developed based on annual forecasted growth factors and construction staging schedules.

Prior to preparing the emissions inventories and conducting the dispersion modeling, the *Air Quality Modeling Protocol for Criteria Pollutants* (see Attachment A to Technical Report 4, *Air Quality*) was prepared. This protocol was submitted to the South Coast Air Quality Management District (SCAQMD) and to the Federal Aviation Administration (FAA) for review and comment. The protocol was revised to address SCAQMD and FAA comments. The protocol provides a discussion of the basic approach used in this report. The following sections provide additional details and explanations of specific data. The methodologies used in this analysis are based on an extensive body of literature; Attachment B in Technical Report 4, *Air Quality* contains the bibliography developed to support this effort.

Developing emissions inventories for the environmental baseline was one of the critical steps used to identify emission source types at the airport and forecast future year emissions, particularly for stationary source emissions. The types, capacities, and locations of stationary sources at LAX are site specific and emission source data, apart from a physical site survey, are not readily available. The environmental baseline inventory, which included a physical site survey of the LAX complex, was very important in identifying information describing all of the stationary sources that exist on airport. The environmental baseline inventory for on-airport LAX sources is presented in the *Air Quality Baseline Inventory* (Attachment C to Technical Report 4, *Air Quality).*

2.1 Emissions Estimates

The emissions estimates were developed using emission factors from a number of agencies, including the U.S. Environmental Protection Agency (USEPA), FAA, California Air Resources Board (CARB), and SCAQMD. Several different emission source categories and source types at the airport generate air pollutant emissions. The emission source categories include construction activities, airport operations, on- and off-airport vehicle traffic, and miscellaneous airport-related area sources. The emission source types include aircraft (which is comprised of four operating modes), aircraft engine testing, ground support equipment (GSE), ground access vehicles (GAV), construction equipment, the Central Utility Plant (CUP), and food preparation, which are described in detail in this section.

The following source types generate the majority of emissions at the airport: aircraft, GSE, GAV, and construction equipment. Other emission source categories at the airport include fuel storage and aircraft refueling, flight kitchens, aircraft and GSE maintenance, surface coating, cooling towers, and restaurants.

The emission potential of each source type is dependent upon the number of emission sources, the level of source activity, and the frequency of use for each. Temporal factors are used in the emissions calculations to account for sources that operate below maximum activity levels and those sources that have intermittent activity. Temporal factors provide the level of activity of operations within a given time frame such as an hour, day, or month. Temporal factors for both mobile and stationary emission sources were used to calculate annual emissions. The temporal factors used were developed for the LAX Master Plan and are presented in Attachment D, Technical Report 4, *Air Quality*.

2.1.1 Pollutants of Concern

The air pollutants of concern include both federal and state criteria pollutants and toxic air pollutants. Emissions inventories were calculated for all pollutants of concern for each source type. This Appendix along with Section 4.6, *Air Quality*, of the Draft EIS/EIR and Technical Report 4, *Air Quality* address the criteria pollutant impact analysis. The assessment of toxic air pollutants is presented in Section 4.24.1, *Human Health Risk Assessment*, of the Draft EIS/EIR and Technical Report 14a, *Health Risk Assessment.*

Emission inventories have been developed for the following criteria pollutants and criteria pollutant precursors: carbon monoxide (CO), oxides of nitrogen (NO_x), nitrogen dioxide (NO_2), volatile organic compounds (VOC), sulfur dioxide (SO_2), and particulate matter with an equivalent aerodynamic diameter less than 10 micrometers (PM_{10}). LAX impacts on ozone (O_3) and sulfate criteria pollutant concentrations are qualitatively determined by assessing the emission inventories developed for their precursors (i.e., NO_x and VOC for O_3, and SO_2 for sulfates). Emissions inventories for lead and sulfates were not developed as airport operations have negligible emission potentials for these two pollutants.

The primary criteria pollutants of concern at airports are CO and the precursors to O_3 and NO_2. Oxides of nitrogen are precursors to both O_3 and NO_2 formation, and VOC are precursors to O_3 formation. The definition of VOC used to calculate emissions is SCAQMD Rule 102[1] and includes any volatile compound of carbon except methane, CO, carbon dioxide, carbonic acid, metallic carbides or carbonates, ammonium carbonate, and certain exempt compounds (USEPA defines VOC at 40 CFR 51.100(s)[2]).

2.1.2 Construction

An air pollutant emissions inventory was compiled for construction activities for the LAX Master Plan alternatives. These emissions were estimated based on assumptions of the magnitude and duration of construction activities, developed for the LAX Master Plan. Emission factors were obtained from regulatory or literature sources to determine the quantity of emissions associated with the construction activities. Total emissions were phased over time based on the developed activity schedules.

Construction activity data used to develop the construction emissions inventory is presented in Attachment E to Technical Report 4, *Air Quality*. This document presents order of magnitude estimates for the construction equipment and duration of activity necessary to develop the LAX Master Plan based on the facilities completion for the horizon year 2015. Equipment types, sizes, manufacturer, and quantity of each type of equipment were identified for each construction phase. Construction vehicle data, such as brake horsepower and fuel consumption estimates, were based on manufacturer's published information. Estimated completion times for each construction phase, which include demolition, earthwork and foundation, utilities, structures, and pavement, were also projected based on the given completion time of each project component. From this information, a time line delineating the development of each project component was created for the entire construction period from 2001 to 2015.

Emission factors for PM_{10} entrainment from soil disturbance due to construction activities were derived from the USEPA's *Compilation of Air Pollutant Emission Factors, Volume 1, AP-42*,[3] (herein referred to as AP-42 Volume 1). Emission factors for PM_{10} entrainment were calculated based on construction vehicle inputs such as vehicle type, weight, speed, and performance characteristics. Emission factors from the SCAQMD's *CEQA Air Quality Handbook*[4] (herein referred to as the SCAQMD Handbook) were used to describe the air pollutant emissions from vehicle exhaust due to diesel fuel combustion. Use of emission factors for diesel combustion reflects the majority of fuel use by construction vehicles. VOC emissions

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[1] South Coast Air Quality Management District, "Rule 102. Definition of Terms," SCAQMD Rules and Regulations, April 9, 1999, Available: http://www.aqmd.gov/rules [May 24, 2000].

[2] Code of Federal Regulations, Title 40, Part 51, Section 100, Paragraph(s), as amended April 9, 1998.

[3] U.S. Environmental Protection Agency, Office of Air Quality Planning and Standards, Compilation of Air Pollutant Emission Factors, Volume 1: Stationary Point and Area Sources (AP-42), Fifth Edition and Supplements, Available: http: //www.epa.gov/ttn/chief/ap42.html#chapter and http://www.epa.gov/ttn/chief/ap42supp.html [May 23, 2000].

[4] South Coast Air Quality Management District, CEQA Air Quality Handbook, 1993.

due to architectural coatings and solvents as well as PM_{10} emissions from demolition activities were calculated based on the SCAQMD Handbook. Construction vehicle emission factors used in the analysis are detailed in Attachment F to Technical Report 4, *Air Quality*.

USEPA, CARB, and the large construction equipment manufacturers (Caterpillar, Case, etc.) signed the Diesel Statement of Principles in 1996 which requires that low-NO_x emitting construction equipment be phased in between 2001 and 2005. According to this agreement, by 2005, all construction equipment sold in the United States will by required to meet a 2.5 grams of NO_x per brake horsepower (g/bhp) emission standard. This reduction in NO_x emissions is addressed in the SCAQMD's *1997 Air Quality Management Plan*,[5] as Control Measures M9 and M10. Therefore, in the period prior to 2001, the NO_x emission factors used in this analysis were taken from both AP-42 Volume 1 and the SCAQMD Handbook. The emission factors used for the analysis of post-2001 years, involved the straight-line (20-percent per year) reduction of the NO_x emission factors until the target emission factor (2.5g/bhp) is reached in 2005. All affected equipment utilized for project construction will be required to meet LAX Master Plan Commitment AQ-1. This policy requires the phase in of certified low-NO_x construction equipment by 20 percent per year until 2005 when all affected equipment will be low-NO_x-certified.

Exhaust emission factors from construction worker commuter trips and truck material and debris haul trips were calculated from emission factors modeled from the CARB emission factor model EMFAC 2000 Version 1.99.[6] Emission factors associated with worst-case temperatures conducive to pollutant formation were used for emission factors for the criteria pollutants. Emission factors were modeled for the entire time line of the LAX Master Plan (2001 through 2015). Quarterly manpower estimates were developed, for which an Average Vehicle Ridership (AVR) of two was applied to determine the number of vehicles commuting to the construction site. Commuter trip length was estimated from the SCAQMD Handbook based on average trip lengths for worker trips. The total Vehicle Miles Traveled (VMT) was obtained by multiplying the number of vehicles by the average travel distance. The VMT was then multiplied by the EMFAC 2000 emission factors to quantify the criteria pollutant emissions associated with worker commuter trips and haul trips over the course of the entire construction period.

As shown in Attachment G to Technical Report 4, *Air Quality*, the emission inventory for construction activities was calculated initially using a pounds of pollutant produced per hour basis for every individual vehicle. Exhaust emissions factors and PM_{10} emission factors were summed to obtain the total emissions emitted by an individual construction vehicle. Hourly emission rates were calculated for all vehicle types using project specific information where available or guidance default values for the variables in the emission factor calculations. Project specific data regarding construction activities are provided in Attachment E to Technical Report 4, *Air Quality*. Individual construction vehicles were grouped into construction crews to perform specific tasks, based on each construction phase – demolition, excavation/foundation, utilities, structures, and pavement. Within these construction phases, crews were assigned to more specific tasks such as residential demolition crews, industrial demolition crews, and airfield excavation crews. Individual hourly construction vehicle emissions were summed to determine the emission rate for the entire work crew. Hourly emission rates for the entire work crew were then multiplied by 10 work hours per day and 5 workdays per week to generate weekly emissions for each construction crew.

The emission inventory for construction activities does not include VOC emissions for any architectural coating applications or runway/taxiway striping at LAX performed during construction. Coating emissions from normal operations are included in the environmental baseline emission inventory for stationary sources. Most surface coatings by 2005 are assumed to be water-based coatings, in accordance with SCAQMD rules and regulations governing the use of coating applications without control devices (direct release into the atmosphere)[7], minimizing VOC emissions.

The various construction crews were grouped together to determine the weekly emissions generated by development of the project component. The weekly emissions were multiplied by 13 weeks per quarter to obtain quarterly emissions in tons per quarter. These quarterly emissions were then distributed over the duration for which they occur along the time line of the LAX Master Plan. Emissions from each project

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[5] South Coast Air Quality Management District, 1997 Air Quality Management Plan, November 1996.

[6] California Air Resources Board, Research Division, EMFAC 2000 On-Road Emissions Inventory Estimation Model Technical Support Document, November 1999.

[7] South Coast Air Quality Management District, "Regulation XI, Source Specific Standards," SCAQMD Rules and Regulations, Available: http://www.aqmd.gov/rules [May 24, 2000].

component were calculated and placed along this time line to obtain a temporal profile for all construction activities. Construction activity start and end dates were used to take into account construction activity occurring in a partial quarter. Emissions from all project components occurring within the same quarter were then summed to calculate construction emissions on a quarterly basis for the LAX Master Plan construction time line.

Construction duration and activity levels were developed for Alternative C. Construction emission estimates for Alternatives A and B were based on ratios of construction areas for Alternatives A or B to those areas for Alternative C. Emissions attributable to construction worker commuter trips and truck material and debris haul trips were assumed to be the same for the three build alternatives.

2.1.3 Operations

The analysis included an identification of all on- and off-airport emission sources associated with LAX. These sources can be divided into three general categories: mobile, stationary, and area. Data for the environmental baseline were obtained through surveys of tenants and traffic as well as from various reference sources, including FAA operation summaries.

2.1.3.1 Mobile Sources

Mobile sources associated with future activities at LAX include both on-road vehicles and nonroad vehicles. On-road vehicles, also referred to as GAV, include those vehicles such as automobiles, trucks, and buses that operate on the public roadways, as well as within public parking lots and garages on LAX property. These public-access areas on airport property are referred to as “landside.” Nonroad vehicles include aircraft, on-board auxiliary power units (APUs), and GSE that operate in the nonpublic access areas on LAX property. These nonpublic access areas on airport property are referred to as “airside.” The GSE are surface vehicles used to service a flight while an aircraft is parked at a gate (e.g., baggage tugs, lavatory carts, push-back tractors). The APU is an on-board engine that operates primarily to provide power to an aircraft while it is parked at the gate when the main engines are off. This analysis does not address all mobile sources which may operate on the airside of the airport and which do not directly service aircraft, such as vehicles owned and operated by LAWA, since such vehicles operate on irregular schedules and they represent a relatively small number of the total airside vehicles. However, the analysis does include airside buses that transport passengers from the main terminals to remote or hard-stand aircraft gate locations, in direct service of aircraft.

Aircraft Operations

Emissions calculations for aircraft were developed primarily using the Emissions and Dispersion Modeling System, version 3.2 (EDMS 3.2),[8] the FAA-required model for airport air quality analysis.[9] EDMS 3.2 was used to determine emissions of CO, NO_X, SO_2, and hydrocarbons (HC) from aircraft. EDMS 3.2 does not calculate emissions of PM_{10} from aircraft, so these emissions were calculated as described in more detail below. Emissions were estimated to account for four aircraft operational modes (taxi/idle, takeoff, climbout, and approach). Emissions associated with the use of reverse thrust on aircraft engines were not quantified. Currently emission factors have not been developed for reverse thrust. The relative time that aircraft use reverse thrust compared to the time spent in other operational modes is minimal, thus emissions for this mode is assumed to have minimal impact on emission inventories.

Aircraft and Aircraft Engine Assumptions

The SIMMOD data[10] and additional information from the LAX Master Plan team provided the basis for selection of aircraft/engine combinations. SIMMOD, FAA’s airport and airspace simulation model, is a comprehensive planning tool for airport designers and managers, air traffic planners, and airline operations analysis. SIMMOD addresses design and procedural aspects of all air traffic operations and produces measures of airport capacity, aircraft travel time, aircraft delay, and aircraft fuel consumption.

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[8] Federal Aviation Administration, Office of Environment and Energy, and U.S. Air Force Armstrong Laboratory, Tyndall Air Force Base, Emission and Dispersion Modeling System (EDMS) Reference Manual (FAA-AEE-97-01), 1997 (with supplements through 1999).

[9] Federal Register, Vol. 63, No. 70 pp 18068-18069, April 13, 1998.

[10] LAX Master Plan Technical Report, prepared for Los Angeles World Airports by Landrum & Brown, to be released prior to the public release of the Draft LAX Master Plan EIS/EIR.

The simulation model uses information about the facilities and operations to predict specific timing, volume, and location (e.g., runway used) for future aircraft operations.

For 2005, SIMMOD data was developed for the No Action/No Project Alternative and Alternative C only. Alternatives A and B were assumed to have the same number of operations and associated impacts as Alternative C in 2005. For aircraft operations in 2005, taxi and queue times were assumed to be similar for Alternatives A, B, and C although differences in runway and gate layouts would result in small differences in taxi and queue times for each build alternative. Since the SIMMOD model was not run for Alternatives A and B in 2005, those small differences in taxi and queue times could not be incorporated into the analyses for those alternatives, but the differences were considered to be minor. For 2015, SIMMOD data was developed for the No Action/No Project Alternative and each of the three build alternatives.

If an aircraft was included in EDMS 3.2, but the engine was not available in the database for that airframe, a similar engine model that was available for that airframe in the database was chosen based on the engine model identification number. If an aircraft was not included in EDMS 3.2, it was added to the system using the “Add Aircraft” utility, along with appropriate times in mode, number of engines, and engine emission factors. Supplemental aircraft/engine information was obtained from (in order of preference): (1) the *FAA Aircraft Engine Emission Database* (FAEED); [11] (2) the *ICAO Engine Exhaust Emissions Data Bank*; [12] (3) USEPA’s *Procedures for Emission Inventory Preparation Vol. IV: Mobile Sources*; [13] and (4) specific engine manufacturers.

Since EDMS 3.2 does not differentiate between passenger and cargo aircraft, cargo aircraft were added to the database identical to their passenger aircraft counterparts, with the differences found in the GSE assignments. The aircraft/engine assignments for passenger and cargo aircraft are shown in **Table 1**, LAX Passenger Aircraft Database Assumptions, and **Table 2**, LAX Cargo Aircraft Database Assumptions, respectively.

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[11] Federal Aviation Administration, Office of Environment and Energy, FAA Aircraft Engine Emission Database (FAEED), 1995.

[12] International Civil Aviation Organization, ICAO Engine Exhaust Emissions Data Bank, 1995.

[13] U.S. Environmental Protection Agency, Office of Air Quality Planning and Standards, Procedures for Emission Inventory Preparation, Volume IV: Mobile Sources, 1992.

Table 1

LAX Passenger Aircraft Database Assumptions

SIMMOD Aircraft (abbreviation)	EDMS Aircraft	# of Engines	Engine
Fokker 100 (100)	FOKKER 100-100	2	TAY 650-15
British Aerospace 146 (146)	BAE146-300	4	ALF502R-5
Airbus A310 (310)	A310-200	2	CF6-80C2A2
Airbus A319 (319)	A319	2	CFM56-5A1
Airbus A320 (320/32S)	A320	2	CFM56-5B4
Airbus A330 (330)	A330	2	CF6-80E1A1
Airbus A340 (340)	A340-200	4	CFM56-5C2
Boeing 727-200 (72S)	B727-200	3	JT8D-15
Boeing 737-200 (737)	B737-200	2	JT8D-9A
Boeing 737-300 (733)	B737-300	2	CFM56-3C
Boeing 737-400 (734)	B737-400	2	CFM56-3C
Boeing 737-500 (73S, 735)	B737-500	2	CFM56-3C
Boeing 747-400 (744)	B747-400	4	PW4056
Boeing 747-200 (747/74E/743)	B747-200	4	JT9D-7R4G2
Boeing 747 Combo (74M)	B747 Combination[1]	4	PW4056
New Large Aircraft (74X)	B747-X[1]	4	PW4056
Boeing 757-200 (757)	B757-200	2	PW2037
Boeing 767-300 (763)	B767-300	2	JT9D-7R4D
Boeing 767-200 (767)	B767-200	2	JT9D-7R4D
Boeing 777 (777)	B777-200	2	PW4084
Airbus A300 (AB3)	A300B	2	CF6-50C
Avions de Transport Régional ATR72 (AT7)	ATR72-200	2	PW124-B
Avions de Transport Régional ATR42 (ATR)	ATR42	2	PW121
Beech (BE1)	BH-1900	2	PT6A-65B
Canadair RJ50 (C50)	Canadair RJ50[1]	2	CF34-3A1
Canadair RJ70 (C70)	Canadair RJ70[1]	2	CF34-3A1
General Aviation Prop (CNA)	GenAvProp[1]	1	PT6A-67B
McDonnell Douglas DC10 (D10)	DC10-30	3	CF6-50C2
Douglas DC8-70	DC8-70	4	CFM56-2C5
McDonnell Douglas DC9 (DC9/D9S)	DC9-50	2	JT8D-17
de Havilland Dash 7 (DS7)	DASH-7	4	PT6A-50
Embraer 120 (EM2)	EMB-120	2	PW118
Embraer 110 (EMB)	EMB110KQ1	2	PT6A-27
Fokker F28 (F28)	F-28-4000	2	RR SPEY-MK555
Fokker 50 (F50)	FOKKER 50	2	PW125-B
Fokker 70 (F70)	FOKKER 70	2	TAY620-15
General Aviation Jet (GAJ)	GenAvJet[1]	2	JT15D-1[2]
Ilyushin Il-96 (ILU)	IL-96	4	PS-90A[3]
Jetstream 31 (J31)	Jetstream 31[1]	2	TPE331-3
Lockheed L1011 (L10/L15)	L1011-500	3	RB211-524B4
McDonnell Douglas MD-11 (M11/MIM)	MD-11	3	PW4460
McDonnell Douglas MD-80 (M80)	MD-80	2	JT8D-217A
McDonnell Douglas MD-87 (M87)	MD-80-87	2	JT8D-217
McDonnell Douglas MD-90 (M90)	MD-90-10	2	V2525-D5
McDonnell Douglas MD-95 (M95)	MD-90-95[1]	2	BR700-710A1-10[3]
Saab 2000 (S20)	Saab 2000[1]	2	AE2100A[4]
Shorts 360 (S36)	SHORT 360	2	PT6A-65AR
Saab Fairchild 340 (SF3)	SF-340A	2	CT7-5
Swearingen Metro (SWM)	Swearingen Metro 2	2	TPE331-3

Listed aircraft are from all SIMMOD analyses for 1996, 2005, and 2015 horizon years. Individual Alternative aircraft are a subset of this list. Times in mode for added aircraft are ICAO defaults.

[1] Aircraft are not included in EDMS. Assumed by CDM.
[2] Chosen for comparable thrust production.
[3] Emission factors from FAEED.
[4] Emission factors from Allison Engines Inc.

Source: Camp Dresser & McKee Inc., 2000

Table 2

LAX Cargo Aircraft Database Assumptions

SIMMOD Aircraft (Abbreviation)	EDMS Aircraft	# Of Engines	Engine
Airbus A300 C4 (300)	A300-C4-200 Cargo	2	CF6-50C2
Airbus A310 (310)	A310-200 Cargo	2	CF6-80C2A2
Boeing 727-200 (72S)	B727 Cargo	3	JT8D-15
Boeing 737-200C (737)	B737-200C Cargo	2	JT8D-17A
Boeing 747-400 (744)	B747-400 Cargo	4	PW4056
Boeing 747-200 (747)	B747-200 Cargo	4	JT9D-7R4G2
Boeing 757-200 (757)	B757-200 Cargo	2	PW2037
Boeing 767-200 (767)	B767-200 Cargo	2	JT9D-7R4D
Beech (BE1)	BH-1900 Cargo	2	PT6A-65B
General Aviation Prop (CNA)	GenAvProp Cargo	1	PT6A-67B
Douglas DC8-70 (DC8)	DC8 Cargo	4	CFM56-2C5
Douglas DC10 (D10)	DC10-30 Cargo	3	CF6-50C2
Douglas DC9 (D9S)	DC9 Cargo	2	JT8D-17
McDonnell Douglas MD-11 (M11)	MD-11 Cargo	3	PW4460

Cargo aircraft included for LAX Master Plan air quality impact analysis.

Listed aircraft are from all SIMMOD analyses for 1996, 2005, and 2015 horizon years. Individual Alternative aircraft are a subset of this list. Times in mode for added aircraft are ICAO defaults.

Source: Camp Dresser & McKee Inc., 2000.

EDMS 3.2 does not contain emission indices for PM_{10} from aircraft, therefore, the model cannot be used to calculate PM_{10} mass emissions from aircraft or to disperse PM_{10} emissions attributable to aircraft. The PM_{10} emission indices used in the LAX Master Plan analysis were developed from three primary sources: (1) an analysis of existing aircraft emissions data collected for upper atmosphere research by University of Missouri Professors Philip Whitefield and Donald Hagen;[14] (2) correlations of smoke number versus PM_{10} concentration;[15] and (3) pre-1980 emission factors for several aircraft engines.[16] The PM_{10} emission indices used for the LAX Master Plan are summarized in Attachment H to Technical Report 4, *Air Quality*.

Aircraft LTO Data Assumptions

Aircraft landing and takeoff operations (LTO) data were obtained from SIMMOD data developed for the LAX Master Plan. **Table 3**, Aircraft Landing/Takeoff Operations (LTO) Summary presents a summary of the total annual LTOs forecasted for each alternative and forecast year. Under the assumption that instrument landing conditions would increase delay and thus reduce the number of operations per hour, it was assumed that visual-flight-rule (VFR) data would provide the peak activity. The data were sorted by departure hour and aircraft, and the departures for each aircraft type for each hour were tabulated. The number of annual LTOs for each aircraft type was determined by multiplying the design day number of LTOs by temporal factors to account for variability in the day of the week and month of the year. The annual LTO data for each aircraft type was then entered into EDMS 3.2.

Detailed descriptions of annual LTOs for each aircraft and runway breakdown by alternative and horizon year are included in Attachment I to Technical Report 4, *Air Quality*.

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[14] Whitefield, P. D. and D. E. Hagen, Estimate of Particle Emission Indices as a Function of Particle Size for the LTO Cycle for Commercial Jet Engines – Los Angeles Airport Expansion Project, March 1999.

[15] U.S. Environmental Protection Agency, “American Airlines, Inc.’s Proposed Commercial Aviation Operations Emissions Rule for the South Coast Air Quality Management District,” Proposed 1994 California Federal Implementation Plan (Docket A-94-09, IV-E-49), November 7, 1994.

[16] U.S. Environmental Protection Agency, Motor Vehicle Emission Laboratory, Compilation of Air Pollutant Emission Factors, Volume II: Mobile Sources (AP-42), Fourth Edition, September 1985.

Table 3

Aircraft Landing/Takeoff Operations (LTO) Summary

Alternative / Forecast Year	Annual Passenger Aircraft LTOs	Annual Cargo Aircraft LTOs	Annual Total LTOs
No Action/No Project / 2005	370,889	20,244	391,133
All Build Alternatives / 2005	370,890	22,985	393,875
No Action/No Project / 2015	371,241	20,244	391,485
Alternative A / 2015	439,857	27,105	466,962
Alternative B / 2015	439,857	27,104	466,961
Alternative C / 2015	370,892	27,104	397,996

Source: Camp Dresser & McKee Inc., 2000.

Aircraft Time-In-Mode Assumptions

The takeoff, climbout, and approach times in mode (TIM) resident in EDMS 3.2 are based on the ICAO default values. The takeoff TIM in EDMS 3.2 are unable to be modified by the user. EDMS 3.2 allows the user to modify taxi TIM, which is the total time spent in taxiing and idling during a complete LTO cycle, to reflect site-specific data. EDMS 3.2 performs an adjustment on the approach and climbout TIM based on the following equations.

Approach:

$$T_{new} = T_{old}\,x\,\frac{H}{3000}$$

Climbout:

$$T_{new} = T_{old}\,x\,\frac{(H - 500)}{2500}$$

Where:

T_{new}= adjusted time (min.)

T_{old}= ICAO default time (min.)

H= average mixing height (ft.)

An average mixing height of 542 meters (approximately 1,800 feet) was assumed based on data developed by SCAQMD for LAX (see Attachment J to Technical Report 4, *Air Quality*), which is consistent with data previously reported for this area.[17] **Table 4**, Aircraft Time in Mode, presents the TIM for approach, climbout, takeoff, and taxi that were used to estimate aircraft emissions for all alternatives in both horizon years.

Table 4

Aircraft Time in Mode

		Time In Mode (minutes)					
Aircraft List	Aircraft Engine	ICAO Approach	Adjusted Approach	ICAO Climbout	Adjusted Climbout	ICAO Takeoff	User-Entered Taxi
Fokker 100-100	TAY650-15	4.00	2.40	2.20	1.14	0.70	---[1]
BAE 146-300	ALF502R-5	4.00	2.40	2.20	1.14	0.70	---[1]
A310-200	CF6-80C2A2	4.00	2.40	2.20	1.14	0.70	---[1]
A319	CFM56-5A1	4.00	2.40	2.20	1.14	0.70	---[1]

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[17] U.S. Environmental Protection Agency, Office of Air Programs, Mixing Heights, Wind Speeds and Potential for Urban Air Pollution Throughout the Contiguous United States, 1972.

Table 4

Aircraft Time in Mode

		Time In Mode (minutes)					
Aircraft List	**Aircraft Engine**	**ICAO Approach**	**Adjusted Approach**	**ICAO Climbout**	**Adjusted Climbout**	**ICAO Takeoff**	**User-Entered Taxi**
A320	CFM56-5B4	4.00	2.40	2.20	1.14	0.70	---[1]
A330	CF6-80E1A1	4.00	2.40	2.20	1.14	0.70	---[1]
A340-200	CFM56-5C2	4.00	2.40	2.20	1.14	0.70	---[1]
B727-200	JT8D-15	4.00	2.40	2.20	1.14	0.70	---[1]
B737-300	CFM56-3C	4.00	2.40	2.20	1.14	0.70	---[1]
B737-400	CFM56-3C	4.00	2.40	2.20	1.14	0.70	---[1]
B737-500	CFM56-3C	4.00	2.40	2.20	1.14	0.70	---[1]
B747-400	PW4056	4.00	2.40	2.20	1.14	0.70	---[1]
B747-200	JT9D-7R4G2	4.00	2.40	2.20	1.14	0.70	---[1]
B747Combination	PW4056	4.00	2.40	2.20	1.14	0.70	---[1]
B747-X	PW4056	4.00	2.40	2.20	1.14	0.70	---[1]
B757-200	PW2037	4.00	2.40	2.20	1.14	0.70	---[1]
B767-300	JT9D-7R4D	4.00	2.40	2.20	1.14	0.70	---[1]
B767-200	JT9D-7R4D	4.00	2.40	2.20	1.14	0.70	---[1]
B777-200	PW4084	4.00	2.40	2.20	1.14	0.70	---[1]
A300B	CF6-50C	4.00	2.40	2.20	1.14	0.70	---[1]
ATR72-200	PW124-B	4.50	2.70	2.50	1.30	0.50	---[1]
ATR42	PW121	4.50	2.70	2.50	1.30	0.50	---[1]
BH-1900	PT6A-65B	1.60	0.96	0.50	0.26	0.40	---[1]
Canadair RJ50	CF34-3A1	4.00	2.40	2.20	1.14	0.70	---[1]
Canadair RJ70	CF34-3A1	4.00	2.40	2.20	1.14	0.70	---[1]
GenAvProp	PT6A-67B	4.50	2.70	2.50	1.30	0.50	---[1]
DC10-30	CF6-50C2	4.00	2.40	2.20	1.14	0.70	---[1]
DC8-70	CFM56-2C5	4.00	2.40	2.20	1.14	0.70	---[1]
DC9-50	JT8D-17	4.00	2.40	2.20	1.14	0.70	---[1]
DASH-7	PT6A-50	4.50	2.70	2.50	1.30	0.50	---[1]
EMB-120	PW118	4.50	2.70	2.50	1.30	0.50	---[1]
EMB-110KQ1	PT6A-27	4.50	2.70	2.50	1.30	0.50	---[1]
F-28-4000	RR SPEY-MK555	4.00	2.40	2.20	1.14	0.70	---[1]
Fokker50	PW125-B	4.50	2.70	2.50	1.30	0.50	---[1]
Fokker 70	TAY620-15	4.00	2.40	2.20	1.14	0.70	---[1]
GenAvJet	JT15D-1	1.60	0.96	0.50	0.26	0.40	---[1]
IL-96	PS-90A	4.00	2.40	2.20	1.14	0.70	---[1]
Jetstream 31	TPE331-3	4.00	2.40	2.20	1.14	0.70	---[1]
L-1011-500	RB211-524B4	4.00	2.40	2.20	1.14	0.70	---[1]
MD-11	PW4460	4.00	2.40	2.20	1.14	0.70	---[1]
MD-80	JT8D-217A	4.00	2.40	2.20	1.14	0.70	---[1]
MD-80-87	JT8D-217	4.00	2.40	2.20	1.14	0.70	---[1]
MD-90-10	V2525-D5	4.00	2.40	2.20	1.14	0.70	---[1]
MD-90-95	BR700-710A1-10	4.00	2.40	2.20	1.14	0.70	---[1]
Saab 2000	AE2100A	4.00	2.40	2.20	1.14	0.70	---[1]
SHORT 360	PT6A-65AR	4.50	2.70	2.50	1.30	0.50	---[1]
SF-340-A	CT7-5	4.50	2.70	2.50	1.30	0.50	---[1]
Swearingen Metro 2	TPE331-3	4.50	2.70	2.50	1.30	0.50	---[1]
A300-C4-200 Cargo	CF6-50C2	4.00	2.40	2.20	1.14	0.70	---[1]
A310-200 Cargo	CF6-80C2A2	4.00	2.40	2.20	1.14	0.70	---[1]
B727 Cargo	JT8D-15	4.00	2.40	2.20	1.14	0.70	---[1]
B737-200C Cargo	JT8D-17A	4.00	2.40	2.20	1.14	0.70	---[1]
B747-400 Cargo	PW4056	4.00	2.40	2.20	1.14	0.70	---[1]
B747-200 Cargo	JT9D-7R4G2	4.00	2.40	2.20	1.14	0.70	---[1]
B757-200 Cargo	PW2037	4.00	2.40	2.20	1.14	0.70	---[1]
B767-200 Cargo	JT9D-7R4D	4.00	2.40	2.20	1.14	0.70	---[1]
BH-1900 Cargo	PT6A-65B	4.00	2.40	2.20	1.14	0.70	---[1]
GenAvProp Cargo	PT6A-67B	4.50	2.70	2.50	1.30	0.50	---[1]
DC8 Cargo	CFM56-2C5	4.00	2.40	2.20	1.14	0.70	---[1]
DC10-30 Cargo	CF6-50C2	4.00	2.40	2.20	1.14	0.70	---[1]
DC9 Cargo	CFM56-2C5	4.00	2.40	2.20	1.14	0.70	---[1]
MD-11 Cargo	PW4460	4.00	2.40	2.20	1.14	0.70	---[1]

[1] Taxi/Idle time-in-mode is dependent on alternative and horizon year.

Source: Camp Dresser & McKee Inc., 2000.

Aircraft Emissions

Using aircraft engine emission indices from EDMS 3.2, supplemented as noted above, emissions were calculated for each aircraft type. The following algorithm included in EDMS 3.2 was used.

$$E_{ij} = NE_j * \Sigma [(TIM_{jk}) * (FF_{jk}) * (EI_{ijk})]$$

Where:

E_{ij} = total emissions of pollutant i produced by aircraft type j per LTO cycle (g/LTO)

NE_j = number of engines used on aircraft type j

TIM_{jk} = time in mode k for aircraft type j (s/LTO)

FF_{jk} = fuel flow for mode k for each engine used on aircraft type j (kg/s)

EI_{ijk} = emission index of pollutant i in mode k for engines used on aircraft type j (g/kg)

The total emissions for all aircraft types over the inventory period were calculated using the following procedure.[18]

$$E_{Ti} = \Sigma [(E_{ij}) \text{ x } (LTO_j)]$$

Where:

E_{Ti} = total emissions of pollutant i from aircraft operating at LAX (grams)

LTO_j= total number of LTO cycles for aircraft type j during the inventory period

Estimates for dust entrained from aircraft runways and taxiways were also included, using emission factors from the SCAQMD Handbook and AP-42 Volume 1 to calculate fugitive dust emissions.

PM_{10} emissions for the environmental baseline were calculated using Attachment H to Technical Report 4, *Air Quality* as noted previously. Fleet mix data and airport operations were taken from the LAX Master Plan forecasts.

Ground Support Equipment/Auxiliary Power Units

The GSE types and APU sizes used in emissions calculations vary depending upon the aircraft size and capacity, and whether the aircraft is used for the transportation of cargo or passengers. The GSE and APU emissions inventories were developed using LAX related data and the default GSE assignments included in the EDMS 3.2 model for various types of aircraft. The GSE include push-back tractors, baggage tugs, belt loaders, cabin service, cargo loaders, container loaders, food trucks, fuel trucks, lavatory carts, and water trucks. The use of GSE, such as Ground Power Units (GPUs), Air Conditioning Units (ACUs), Air Starter Units (ASUs), and their respective transporters, was limited to the No Action/No Project Alternative, since gate modifications under the Master Plan would make such equipment obsolete at LAX.

The LAX Master Plan team conducted studies to estimate existing conditions and the market penetration of alternative-fueled and electric-powered GSE for each alternative.[19,20] The GSE fleet compositions were estimated using projections of future LAX purchasing trends that incorporate new clean vehicle technologies developed by manufacturers and introduced to the market. The fleet compositions were developed using available data and information on the existing GSE fleet, annual vehicle retirement and replacement rates, growth factors, regulatory authorities, fleet managers, and the current commitments of manufacturers. For modeling purposes, the vehicle technologies were categorized by fuel type including diesel, gasoline, natural gas, propane, electric and hybrid vehicles. The findings from these studies were used to calculate GSE emissions using FAA and USEPA accepted procedures.

USEPA, CARB, SCAQMD, airlines and airports in the South Coast Air Basin are engaged in a “consultative process” established by USEPA as part of its approval of the 1994 SIP.[21] The focus of this

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[18] U.S. Environmental Protection Agency, Office of Air Quality Planning and Standards, Procedures for Emission Inventory Preparation, Volume IV: Mobile Sources, 1992.

[19] CALSTART, LAX Vehicle Fleet Composition Assessment for 2005 and 2015, June 1998.

[20] CALSTART, Clean Fuel Vehicle Mitigation Strategy Assessment, 1999.

[21] 62 Fed. Reg. 1151, January 8, 1997.

consultative process has been on conversion of GSE to clean fuels. A memorandum of understanding setting forth goals for reducing emissions from GSE is expected to be signed by the parties by the end of the year 2000. As the details of the agreement have not been finalized, this air quality analysis does not incorporate the consultative process.

Emission factors for gasoline and diesel powered GSE were obtained from EDMS 3.2. The emission factors identified by CARB[22] were used for compressed natural gas (CNG) and liquefied natural gas (LNG) fueled GSE. Emissions calculations were based on the equipment fuel type and brake horsepower. Zero emissions were assumed for electric powered GSE. Emission factor data for GSE are presented in Attachment K to Technical Report 4, *Air Quality*.

Assignments of appropriate GSE to aircraft and associated usage times were based on site-specific data developed for the LAX Master Plan (see Attachment L to Technical Report 4, *Air Quality*). Default assignments of GSE included in EDMS 3.2 were used to supplement the site-specific data as needed.

Assignments of GSE to aircraft types were made in two steps: assignment of the GSE type to specific aircraft type, and the assignment of fuel usage to the GSE type. For the 2005 and 2015 No Action/No Project Alternative, GSE assignments were made based on EDMS 3.2 default GSE assignments and the following assumptions:

- No GSE are required for either the passenger or cargo General Aviation Propeller aircraft.
- GPUs, ACUs, ASUs, and their respective equipment transporters were not assigned to passenger aircraft assigned an APU and located at modified terminal gates with central power hookups.
- GPUs and ACUs were only assigned to cargo aircraft and to small aircraft not assigned an APU. Cargo turboprops, specifically the BH-1900 Cargo aircraft, were not assigned GPUs or ACUs. All aircraft assigned GPUs were also assigned GPU transporters.
- ASUs were only assigned to cargo aircraft. All aircraft assigned ASUs were also assigned ASU transporters.
- Fuel trucks were assigned to all small commuter passenger and cargo jets.
- Hydrant trucks were assigned to all passenger and cargo aircraft not assigned fuel trucks.

For the 2005 and 2015 Alternatives A, B, and C, GSE assignments were made based on EDMS 3.2 default GSE assignments and the following assumptions:

- No GSE are required for either the passenger or cargo General Aviation Propeller aircraft.
- GPUs, ACUs, ASUs, and their respective transporters are considered to be obsolete due to the aircraft gate electrification and the aircraft engine technologies specified in the build alternative descriptions. As a result, these GSE types were not assigned to either passenger or cargo aircraft.
- Fuel trucks were assigned to all small commuter passenger and cargo jets.
- Hydrant trucks were assigned to all passenger and cargo aircraft not assigned fuel trucks.

Once specific GSE vehicle types were assigned, the fleet composition was determined. Fuel types were assigned according to the predicted penetration of alternative fuels.[23,24] The following assumptions were used when determining the fleet composition:

- Although an airline may have identical GSE powered by different fuels servicing a single aircraft type, this level of information was not available. Therefore, each aircraft type was assigned one fuel type per GSE type.
- Cabin Service or Food Truck vehicle fleet compositions were not available. Fleet compositions for step vans[25] were used for both of these types of GSE.
- Fleet compositions were unavailable for Water Truck vehicles. The fleet composition for pickup trucks was used for this type of GSE.

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[22] California Air Resources Board, Air Pollution Mitigation Measures for Airports and Associated Activity, 1994.

[23] Janneh, Mustapha, CALSTART, Personal Communication, March 3, 2000.

[24] CALSTART, Clean Fuel Vehicle Mitigation Strategy Assessment, 1999.

[25] CALSTART, Clean Fuel Vehicle Mitigation Strategy Assessment, 1999.

- At LAX, it was determined that Lavatory Carts and not Lavatory Trucks are used. As these more closely resemble pickup trucks, the fleet composition for pickup trucks was used for this type of GSE.
- For the build alternatives in 2015, a small penetration of hybrid-fueled Cabin Service, Food Truck, and Water Truck vehicles is predicted. Since emission factors for hybrid vehicles were unavailable, it was assumed that the possible combinations of battery, fuel cell, and clean fuel internal combustion (IC) engine technologies available in hybrid vehicles in future scenarios would result in negligible emission levels. The overall percentage of hybrid vehicles in the GSE fleet is low so that their potential emissions are more than counter-balanced by the conservative vehicle emission factors used for conventional powered GSE. Therefore, the hybrid-fueled GSE were categorized as electric GSE.

Specific assignments of GSE to aircraft by project alternative horizon year are included in Attachment L in Technical Report 4, *Air Quality*. Assignments of APUs to aircraft types for all alternatives in each horizon year were based on EDMS 3.2 default APU assignments.

Ground Access Vehicles

Ground access vehicle trips generated to and from LAX have regional and local air quality impacts. Both a regional off-airport and a local on-airport GAV air quality analysis were conducted using regional traffic and on-airport traffic data developed for the LAX Master Plan. GAV emissions for on-road and parking area sources were calculated using the CARB methodology, and site-specific data developed for the LAX Master Plan. This section presents the methodologies for both the on-airport and the off-airport traffic analysis.

CARB, SCAQMD, and the City of Los Angeles, have proposed and implemented programs and regulations that target air pollutant emissions from on-road mobile vehicles or GAV. Some of these programs and regulations have been incorporated into the air quality analysis through the use of the CARB emission factor model, EMFAC 2000, used to calculate GAV emissions. The EMFAC 2000 model incorporates forecasted clean fuel technologies and emission reductions for various pollutants resulting from recent state legislation and implementation goals.[26] The state emission standards and programs incorporated into EMFAC 2000 include district Inspection and Maintenance (I/M) programs, California Cleaner Burning Gasoline (reformulated gasoline), near zero evaporative standards, on-road motorcycle standards, low emission vehicle standards (LEV I and LEV II), and standards for heavy-duty engines. The standards for heavy-duty engines include off-cycle NO_x mitigation and exhaust emissions standards for urban transit buses. The EMFAC 2000 model does not incorporate the future changes in vehicle fleet composition resulting from proposed state legislation and proposed and recently adopted local legislation.

In the South Coast Air Basin, the SCAQMD and the City of Los Angeles have adopted and proposed additional rules and policies which govern cleaner fuel use and pollutant emission reductions in public vehicle fleets.[27] The SCAQMD has recently adopted the following rules for clean on-road vehicles: 1191 for Light-and Medium-Duty Public Fleet Vehicles, 1192 for Clean On-Road Transit Buses, 1193 for Refuse Collection Vehicles, and 1194 for Commercial Airport Operations GAV. The SCAQMD has proposed a series of rules that apply to clean fuel technology use in on-road school buses, on-road heavy-duty public fleets, street sweepers, and the reduction of sulfur content in liquid fuels. In addition, the City of Los Angeles has adopted Policy CF#00-0157 requiring that all City-owned or operated diesel-fueled vehicles be equipped with particulate traps and use low-sulfur diesel by the end of 2002. CARB recently adopted its Risk Reduction Plan for Diesel-Fueled Engines and Vehicles. These rules, plans and policies have not been incorporated into this air quality analysis. The SCAQMD has conducted a regional environmental assessment of the clean on-road vehicle rules. The air quality benefits from these rules have larger regional implications, where public fleets make up roughly 25 percent of the vehicle universe. Within the LAX study area, however, the municipal government fleets represent a much smaller portion of the total vehicle miles traveled (VMT) than in the South Coast Air Basin as a whole. For the purposes of emission calculations and dispersion modeling, the adopted and proposed SCAQMD rules, City policies, and CARB plans will not substantially change the emission factors or the vehicle fleet mix used in the emissions calculation. The emission forecasts developed for this Draft EIS/EIR provide conservative results.

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[26] California Air Resources Board, Public Meeting to Consider Approval of Revisions to the State's On-Road Motor Vehicle Emissions Inventory; Technical Support Document, May 2000.

[27] South Coast Air Quality Management District, Final Program Environmental Assessment for: Proposed Fleet Vehicle Rules and Related Rule Amendments, June 5, 2000.

On Airport

The on-airport GAV analysis includes emissions estimates for on-road traffic and parking structure/area sources. A study of existing traffic conditions was conducted for the environmental baseline.[28] The study identifies the on-airport access ramps used to define the boundaries of the on-airport traffic analysis and the types of vehicles accessing on-airport facilities. On-road vehicles that access on-airport facilities include privately owned vehicles, government-owned vehicles, rental cars, shuttles, buses, taxicabs, and trucks. The on-airport access ramps connect to on-airport roadway links that lead on-road traffic to and from the Central Terminal Area (CTA) and the proposed West Terminal Area (WTA) and the commercial cargo and ancillary facilities. The methodology used to calculate emissions from on-road vehicles operated during construction are addressed in Section 2.1.2, *Construction*.

The on-road vehicle and parking facility emissions were calculated using site-specific data developed for the LAX Master Plan and emission factors generated from EMFAC 2000 version 1.99. The site-specific data used to estimate emissions include trip generation, vehicle trip distances, idle and soak times (time between engine starts), vehicle fleet mix, and average travel speeds based on specific roadway segments and parking facilities. CARB methodologies and SCAQMD data were used for unavailable on-site data (e.g., fugitive dust from roadways). The EMFAC 2000 emission factors used are presented in Attachment M of Technical Report 4, *Air Quality*.

Traffic data for on-road vehicle and parking facility activity was developed, including trip generation information for acquisition areas and commercial cargo and ancillary facilities in the 2005 and 2015 horizon years for each alternative. The on-airport traffic and parking data used to develop emission estimates include hourly traffic volumes, vehicle fleet mix, and peak hour vehicle counts. The peak hour for on-airport traffic volumes generally occurs between 11:00 AM and 12:00 noon. Exceptions to this peak hour include employee parking areas and the west side on-airport access areas, which have a peak hour between 12:00 noon and 1:00 PM.

Due to varying vehicle emissions characteristics, CARB divides GAV into distinct vehicle classes based upon vehicle weight and fuel type. The GAV categories used in the traffic analysis, such as privately owned vehicles, buses, taxicabs, etc., are categorized under the specified vehicle classes used in the CARB mobile-source emission models. The 10 vehicle classes used in the CARB mobile-source emission models and in the on-airport vehicle fleet mix are listed below.

- LDA - light duty autos (non-catalyst, catalyst, and diesel), typical passenger car; does not include vans, pickup trucks or sport-utility vehicles (SUVs).
- LDT - light duty trucks, including vans, pickup trucks and SUVs (non-catalyst, catalyst, and diesel), with a gross vehicle weight (GVW) of 5,750 pounds or less.
- MDT - medium duty trucks (non-catalyst and catalyst) with a gross vehicle weight (GVW) between 5,751 and 8,500 pounds.
- LHGT - light-heavy gasoline trucks (non-catalyst and catalyst) with a GVW between 8,501 and 14,000 pounds.
- LHDT - light-heavy diesel trucks with a GVW between 8,501 and 14,000 pounds.
- MHGT – medium-heavy gasoline trucks (catalyst and non-catalyst) with a GVW between 14,001 and 33,000 pounds.
- MHDT - medium-heavy diesel trucks with a GVW between 14,001 and 33,000 pounds.
- HHDT - heavy-heavy diesel trucks with a GVW between 33,001 and 60,000 pounds.
- UBD - urban transit buses (diesel) and intra-city transit buses; does not include inter-city transit buses (e.g., Greyhound) or school buses.
- MCY - motorcycles (non-catalyst).

The GAV fleet mix for airport roadway links and parking facilities was calculated using site-specific data developed for the LAX Master Plan. The GAV category fractions were determined by area for the CTA, the WTA, and Spine Road/World Way West for each build alternative in the 2005 and 2015 horizon years. A 65/35 percent breakdown is used between autos (LDAs) and SUVs, pickup trucks and vans (LDTs). The EMFAC 2000 output provides the percent distribution of technology type under each vehicle class (i.e., non-catalyst, catalyst, and diesel). The CARB regulations and forecasts for alternative-fuel vehicle

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[28] Leigh Fisher Associates, Update Existing Conditions to 1996 On-Airport Transportation, 1998.

use—including low-emission vehicles (LEV), ultra low-emission vehicles (ULEV), super ultra low-emission vehicles (SULEV), and zero-emission vehicles (ZEV)--and the technology fraction for each vehicle class in each alternative are incorporated into the EMFAC 2000 model.

Roadway Traffic

The vehicle fleet mix was calculated for each roadway link within the airport boundary. The on-airport vehicle fleet mix for roadway traffic for each alternative in the 2005 and 2015 horizon years is presented in Attachment N in Technical Report 4, *Air Quality*. The vehicle fleet mixes for 2005 and 2015 are not significantly different. Light duty autos and light duty trucks with catalysts generally make up the majority of the on-airport vehicle fleet mix on the CTA and WTA access roadways and cargo ramps.

The CARB mobile source emission model was used to generate emission factors for each vehicle class in grams per unit (i.e., hour, mile, or trip) for each criteria pollutant for the environmental baseline and the LAX Master Plan alternatives for each horizon year. The model was used to generate emission factors for the following types of emissions: running exhaust emissions, variable start emissions, and evaporative emissions, which consist of diurnal, hot soak, running, and resting losses. Diurnal and resting evaporative emissions were not included for CTA and WTA roadway traffic. The average emission factors were determined for the on-airport GAV fleet mix using the average of the summer (75^oF) and winter (50^oF) emission factors. The SCAQMD Handbook and AP-42 Volume 1 emission factors for entrained road dust were used to estimate fugitive dust emissions from major roads and highways. The emissions produced by GAV activity on on-airport roadways were calculated using the following equation:

$$E_t = {}_r\Sigma(E_r)$$

Where:

E_t = total on-airport roadway pollutant emissions (grams/year)

E_r = total link r pollutant emissions (grams/year)

${}_r\Sigma$ = summation through roadway links r

and

$$E_r = {}_v\Sigma[T_r]x[F_{vr}]x\{[L_r]x([EF_{rsv}]+[EF_{ersv}]+[EF_{tw}]+[EF_{bw}]+[EF_{rd}])+[EF_{iv}]x[T_{ivr}]+[EF_{svst}]x[F_{vsr}]+[EF_{hsv}]x[F_{vsr}] +[EF_{dv}]x[ST_{vr}]xF_{vsr}]+[EF_{rstv}]x[ST_{vr}]x[F_{vsr}]\}$$

Where:

${}_v\Sigma$ = summation through vehicle types v

T_r = annual vehicle trips for the roadway link r (trips/year)

F_{vr} = vehicle type v fraction for the roadway link r

L_r = length of roadway link r traveled per vehicle trip (miles/trip)

EF_{rsv} = running emission factor at the road link speed rs for the vehicle type v (grams/mile)

EF_{ersv} = evaporative running emission factor at the road link speed rs for the vehicle type v (grams/mile), for VOC emissions only

EF_{tw} = tire wear tw emission factor (grams/mile), for PM10 emissions only

EF_{bw} = brake wear bw emission factor (grams/mile), for PM10 emissions only

EF_{rd} = road dust rd emission factor (grams/mile), for PM10 emissions only

EF_{iv} = idle i emission factor for the vehicle type v (grams/minute)

T_{ivr} = idle i time for the vehicle type v at the roadway link r (minutes)

EF_{svst} = variable start s emissions for each vehicle type v for the designated soak time st (grams/start), for VOC, CO, and NO_x emissions only

F_{vsr} = fraction of vehicle type v that has variable starts s at the roadway link r

EF_{hsv} = hot soak hs emission factor (grams/trip) for vehicle type v, VOC emissions only

EF_{dv} = diurnal emission rates (grams/hour) for vehicle type v, VOC emissions only

ST_{vr} = soak time (hr) for vehicle type v on roadway link r

EF_{rstv} = resting losses (grams/hour) for vehicle type v, VOC emissions only

Vehicle trips, trip distances, idle times, time between engine starts, and average travel speeds were based on specific roadway segments analyzed in the traffic impact studies conducted for the LAX Master Plan EIS/EIR. The specific information on roadway links and vehicles used to calculate on-road vehicular traffic emissions is presented in Attachment O in Technical Report 4, *Air Quality* by alternative and horizon year.

Parking Facilities

The vehicle fleet mix was calculated for each on-airport parking facility. The parking facilities are for short-term parking, long-term parking, employee parking, commercial vehicle holding areas (staging), and rental car (RAC) facilities. The on-airport vehicle fleet mix for parking facilities by alternative and horizon year are presented in Attachment P in Technical Report 4, *Air Quality*. The vehicle fleet mix for parking facilities consists of light duty autos, light duty trucks, and urban diesel buses. Light duty autos and light duty trucks with catalysts make up the majority of the fleet mix for the parking facilities.

In estimating GAV emissions for on-airport parking facilities, the CDM team used a similar methodology to the one used to estimate GAV roadway emissions. The CARB mobile-source emission models factors were used, incorporating site-specific data and resting evaporative emissions for the parking structure/areas. Fugitive emissions from road dust are considered to be negligible due to low vehicle speeds in the parking structure/areas; however, particulate emissions due to tire and brake wear are included. The emissions produced by GAV within the on-airport parking facilities were calculated as follows:

$$E_t = {}_p\Sigma(E_p)$$

Where:

E_t = total on-airport parking pollutant emissions (grams/year)

E_p = pollutant emissions per parking structure/area p (grams/year)

${}_p\Sigma$ = summation through parking facilities p

and

$$E_p = {}_v\Sigma[T_p]x[F_{vp}]x\{[L_p]x([EF_{psv}]+[EF_{epsv}]+[EF_{tw}]+[EF_{bw}])+[EF_{iv}]x[T_{ivp}]+[EF_{svst}]x[F_{vsp}]+[EF_{hsv}]x[F_{vsp}]+[EF_{dv}]x[ST_{vp}]x[F_{vsp}]+[EF_{rstv}]x[ST_{vp}]x[F_{vsp}]\}$$

Where:

${}_v\Sigma$ = summation through vehicle types v

T_p = annual vehicle trips for the parking structure/area p (trips/year)

F_{vp} = vehicle type v fraction for the parking structure/area

L_p = length of distance traveled in the parking structure/area per trip p (miles/trip)

EF_{psv} = running emission factor at the parking structure/area link speed ps for the vehicle type v (grams/mile)

EF_{epsv} = evaporative running emission factor at the parking structure/area speed ps for the vehicle type v (grams/mile), for VOC emissions only

EF_{tw} = tire wear tw emission factor (grams/mile), PM10 emissions only

EF_{bw} = brake wear bw emission factor (grams/mile), PM10 emissions only

EF_{iv} = idle i emission factor for the vehicle type v (grams/minute)

T_{ivp} = idle i time for the vehicle type v at the parking structure/area p (minutes)

EF_{svst} = variable start s emissions for each vehicle type v for the designated soak time st (grams/start), VOC, CO, and NO_x emissions only

F_{vsp} = fraction of vehicle type v that has variable starts s at the parking structure/area p

EF_{hsv} = hot soak hs emission factor (grams/trip) for vehicle type v, VOC emissions only

EF_{dv} = diurnal emission rate (grams/hour) for vehicle type v, VOC emissions only

ST_{vp} = soak time (hrs) for vehicle type v at parking structure p

EF_{rstv} = resting losses (grams/hour) for vehicle type v, VOC emissions only

Emissions for each on-airport parking facility were calculated. For multi-level parking structures, the sum of the emissions for each level was used as an emissions estimate. The LAX Master Plan team provided the idle times, the average distance traveled, and the GAV category fractions within each facility. The specific parking facility data used to estimate emissions from parking sources are given in Attachment P in Technical Report 4, *Air Quality* by alternative and horizon year.

Off Airport

The off-airport (regional traffic) emissions were calculated for three separate regional areas: (1) the "Tier 1 Area" surrounding the airport; (2) the South Coast Air Basin, including the Tier 1 Area; and (3) outside the South Coast Air Basin (i.e., Ventura County, Palmdale, Lancaster).

The regional traffic emission calculations were performed based on vehicle miles traveled (VMT) and average-daily trip (ADT) data developed for the LAX Master Plan. This analysis included emissions associated with vehicles of airport passengers, employees, cargo and ancillary operations, and collateral development.

Emissions were estimated for:

- Reactive Organic Gases (ROG)
- NO_x
- CO
- PM_{10} for:
  - Exhaust (PMEX)
  - Tire Wear (PMTW)
  - Brake Wear (PMBW)
- Sulfur oxides (SO_x)

VOC emissions were assumed to be equal to ROG emissions.

The peak hourly AM, PM, and airport peak (AP) VMT traffic numbers were developed for all alternatives for the years 1996, 2005, and 2015, and are presented in Attachment P of Technical Report 4, *Air Quality*. The fleet mix and average emission factors, per VMT, were calculated using the VMT, ADT, and vehicle speed mix data, in addition to the regional fleet mix and emission defaults for 2005 and 2015 developed for the LAX Master Plan.

The AM peak, PM peak, and AP hourly VMT data were converted to daily VMT based on conversion factors provided for the LAX Master Plan.[29]

Version 1.99 of the EMFAC 2000 model was used in the emissions analysis. An EMFAC run adjusts the base emission rates for non-standard driving conditions, which are referred to as correction factors. These correction factors include driving conditions such as speed, temperature, fuel type, and driving cycles. Data input into the model include both VMT and vehicle speeds.[30] The model then calculates emissions for PM_{10}, CO, NO_x, SO_x, and ROG.

The BURDEN model, within the EMFAC 2000 suite, combines emission factors with county-specific activity data, including the population of vehicles, the VMT, and the number of vehicle starts. The corresponding emission rates are expressed as grams per vehicle, grams per mile, and grams per start. An inventory is then calculated by multiplying the emission factor by its associated activity. Emissions were evaluated for each county for the 10 vehicle classes listed previously.

These models also account for the penetration of alternative fuels (e.g., natural gas and electricity). California law regulates technology group sales fractions required for each vehicle model year. These vehicle model year sales fractions are implicit in the base emission rates used in the EMFAC 2000 model. For example, by 2005, two percent of sales by major motor vehicle manufacturers are required to be ZEVs. The regulated market penetration for each alternative fuel and alternative technology vehicle is provided in Attachment R in Technical Report 4, *Air Quality*.

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[29] Parsons Transportation Group Inc., Conversion Factors for Hourly VMT to Daily VMT, 1998.

[30] Parsons Transportation Group Inc., Regional Traffic VMT and Vehicle Speeds, 1999.

Regional emissions were calculated by multiplying the emission factor for each vehicle class by its associated activity (e.g., VMT). Emissions were calculated for running exhaust, variable starts, and evaporative emissions, which consist of diurnal, hot soak, running, and resting losses. Brake wear and tire wear emissions were also estimated.

Other parameters that are accounted for by the emission models include:

- Non-catalyst-equipped vehicles (NCAT)
- Catalyst-equipped vehicles (CAT)
- Diesel-fueled vehicles (DSL)

Emissions were calculated for the environmental baseline, the No Action/No Project Alternative, and Alternatives A, B, and C

To obtain the criteria pollutant, except SO_2, emission factors for the South Coast Air Basin in 2005, EMFAC 2000 was run using the following parameters:

Temperatures (°F): 60, 75, and 85

Miles per hour (mph): 5, 15, 25, 30, 35, 45, 55, and 65

Percent relative humidity (RH): 0 – 100%

Auto Model Years: 1970-2005

The criteria pollutant, except SO_2, emission factors for the South Coast Air Basin for 2015 were calculated using the same temperature, mph, and RH data. However, the auto model years were revised to 1980 through 2015.

EMFAC 2000 does not provide SO_2 emissions factors for running exhaust, variable starts, etc. in the same manner that it does for CO, ROG, NO_x, and PM_{10}. In order to determine vehicle SO_2 emissions factors, countywide SO_2 emissions were calculated using BURDEN for each of the horizon years and these annual emission totals were then divided by the total countywide VMT estimates used in BURDEN to obtain an average SO_2 emission rate per VMT. The LAX specific VMT totals for each county, alternative, and horizon year were then multiplied by the respective countywide SO_2 emission factors to determine the annual SO_2 emissions for each alternative and horizon year.

2.1.3.2 Stationary Point Sources

Stationary point sources that contribute to air quality in the vicinity of LAX exist on and off airport property. Available data and a comprehensive survey of Los Angeles World Airports (LAWA) and tenant facilities were used to develop the environmental baseline emissions inventory identifying existing stationary point sources at LAX; see Attachment C in Technical Report 4, *Air Quality*. The environmental baseline emissions inventory details equipment capacities, typical operating hours, existing control equipment, and emissions data. The existing stationary sources at LAX consist of a variety of source types such as fuel combustion units, coating and solvent activities (maintenance), organic liquid storage and transfer activities, and miscellaneous activities. The source types for the existing stationary sources are listed in **Table 5**, Stationary Sources at LAX. Large stationary sources off airport and near LAX that contribute to the air quality in the area are discussed qualitatively below.

Fuel combustion units include external combustion equipment, internal combustion equipment, and fire-fighting training fires. Internal combustion engines are used to produce electrical power, such as turbine generators, emergency generators, and GPUs. External combustion equipment is used in boilers, water heaters, and food preparation equipment. Coating and solvent activities include the operation of spray painting booths and associated clean up of coating equipment with solvents, such as degreasing. Organic liquid storage and transfer includes primarily the storage of petroleum products, such as aircraft fuels (Jet A, AvGas), motor vehicle fuels (gasoline, diesel), and lubricants (oil), and handling of these materials, such as loading and unloading fuels.

The CDM team developed emissions estimates for individual source types based on methodologies accepted by USEPA[31] and the FAA's *Air Quality Procedures for Civilian Airports & Air Force Bases* (herein referred to as Air Quality Procedures).[32] Where appropriate, SCAQMD Best Available Control Technology

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[31] U.S. Environmental Protection Agency, Office of Air Quality Planning and Standards, Procedures for Emission Inventory Preparation, Volume IV: Mobile Sources, 1992.

Table 5

Stationary Sources at LAX

Source Category	Source classification	Future Year Multiplier
Central Utility Plant (CUP)	Boilers Gas Turbines Internal Combustion Engines	Based on the size of the future West Terminal Area (WTA) (Existing CTA CUP is assumed to stay at current capacity)
CUP Cooling Tower (CT)	Cooling Tower	Based on the size of the future WTA (Existing CT is assumed to stay at current capacity)
Engine Test Facilities	Jet Engine Testing	Future activity levels and parameter data provided by LAX Master Plan team.
Fire Training Facility	Training Fires	Training fires will not be conducted on site in the future.
Flight Kitchens	Boilers Charbroiling Cooking Cooling Towers Heaters Internal Combustion Engine	Ratio of future MAP to 1996 MAP
Fueling Facilities	Jet A Storage and Refueling/Gasoline Storage and Refueling	Future throughput and tank parameter data provided by LAX Master Plan team.
Maintenance Facilities	Boilers Degreasing Operations Furnaces Heaters Internal Combustion Engines Surface Coating	Ratio of future LTOs to 1996 LTOs
Restaurants	Charbroiling Cooking	Ratio of future MAP to 1996 MAP

Source: Camp Dresser & McKee Inc., 2000.

(BACT) Guideline[33] requirements (herein referred to as the SCAQMD BACT Guideline) were incorporated into the emission estimates. The uncontrolled emission factors were obtained primarily from AP-42 Volume 1. Control efficiencies were applied to those units with control devices/technologies. The total stationary source emissions were calculated by taking the sum of the emissions calculated for each source type identified at the stationary source location.

The configurations of stationary sources at LAX for the alternatives in the horizon years were based upon the environmental baseline adjusted to future airport activity levels. In estimating future year emissions, environmental baseline emissions were multiplied by an appropriate growth factor for that source category. Future capacity and hours of operation for stationary sources were scaled based upon future-to-baseline ratios of either aircraft operations, number of passengers, or terminal area for each alternative. Future activity levels for fuel storage and refueling operations were based on specific data provided for the LAX Master Plan. For example, flight kitchens prepare the onboard aircraft food consumed by passengers; therefore, to determine future year emissions for Alternative C, the 1996 flight kitchen emissions levels were multiplied by the increase in annual passengers projected for the two horizon years, 2005 and 2015. The future year multiplier for each stationary source category is listed in **Table 5**. The stationary source emission calculation methodology for future years is as follows:

$$E_{oc} = E_{oc1996} \times M_{oc}$$

Where

E_{oc} = future year operating category oc emissions (grams)

E_{oc1996} = 1996 operating category oc emissions (grams)

M_{oc} = future year operating category oc multiplier

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[32] Federal Aviation Administration, Office of Environment and Energy, Air Quality Procedures for Civilian Airports & Air force Bases, 1997.

[33] South Coast Air Quality Management District, Best Available Control Technology Guideline, 1994.

Several emission sources were deleted from the 1996 emission inventory for the purpose of emission forecasting. Stationary internal combustion engines that are also GSE (i.e., ACUs, ASUs, and GPUs) were eliminated from the stationary point source inventory to avoid double counting these emission source types. Specific sources that were identified in the LAX Master Plan to be replaced/decommissioned due to the reconstruction or elimination of their associated facilities were deleted from the estimates for the alternatives. The specific sources that are assumed to be replaced/removed from airport property include rental car facility gasoline storage tanks, inefficient old cooling towers (i.e., Delta Airlines cooling tower, US Post Office cooling tower), the 96th Street Burger King, and the Proud Bird Restaurant.

Combustion Sources

Fuel combustion sources generate both criteria pollutants as well as toxic air pollutants (metals and polynuclear aromatic hydrocarbons, PAHs). Combustion is the primary source of CO, NO_x, PM_{10}, and SO_2 emissions from stationary sources located on airport property. The combustion sources resident at LAX include gas turbines, boilers, heaters, cooking and charbroiling equipment, and stationary internal combustion engines. The fuels used to power combustion equipment include natural gas, propane, gasoline, wood, and fuel oil. The type of fuel used for each type of combustion source is listed in **Table 6**, Combustion Source Fuel Type.

Table 6

Combustion Source Fuel Type

Combustion Source	Fuel Type
Gas Turbines	Natural Gas, Fuel Oil Backup
Boilers/Heaters	Natural Gas, Fuel Oil Backup
Cooking/Charbroiling	Natural Gas, Wood
Internal Combustion Engines	Diesel, Gasoline, Propane, Natural Gas

Source: Camp Dresser & McKee Inc., 2000.

Emissions for each source type were calculated based on fuel consumption and pollutant emission factors. Emissions calculations for stationary internal combustion engines are also based on the engine power rating (hp), usage rate, and pollutant emission indices determined from power output and fuel type developed from the available information collected during the baseline survey. Air pollution control equipment in use, or required in the future as identified in SCAQMD, CARB, or USEPA rules and regulations, has been incorporated into the calculations. The emissions from combustion sources are calculated using emission factors from AP-42 Volume 1 as follows:

$$E_n = \sum_i \left[F x EI_i \right]$$

Where:

E_n = total emissions of pollutant i emitted from the source during the inventory period (grams)

$_i\Sigma$ = summation through pollutants i

F = total amount of fuel consumed during the inventory period (million cubic meters of natural gas or propane or kiloliters of diesel/fuel oil or metric tons of wood)

EI_i = emission index for pollutant i (grams of pollutant per unit of fuel)

Central Utility Plants

Emissions from Central Utility Plants (CUP), which house on-site power plants and heating and cooling facilities were calculated using natural gas as the primary fuel. Natural gas is the primary fuel for the existing CUP. The SCAQMD BACT Guideline requires that natural gas be used on any new utility boilers and turbines to minimize PM_{10} and SO_2 emissions. Several miscellaneous LAWA combustion emission sources (e.g., building comfort heating) were included as part of the existing CUP combustion source emission category.

The environmental baseline emissions inventory for the existing CUP includes continuous emissions monitoring data for NO_x and CO. The existing CUP is currently operating at or near peak load. For all alternatives in future years, it is assumed that the existing CUP will continue to operate at peak load and maintain the environmental baseline emissions levels. The SCAQMD will require that the total RECLAIM emissions from the existing CUP be reduced in the future; however, it is assumed that these reductions will be accomplished through emission offsets rather than modifying the equipment/emissions at the CUP.

The build alternatives include the existing CUP and a proposed Westside CUP located between the main WTA short-term parking area and the bypass road. The proposed Westside CUP under the build alternatives is designed to have effective capacity/load of 1.2 times the existing CUP and the HVAC coolers would be powered solely be electric motors in place of steam consuming HVAC systems. The proposed Westside CUP boilers (total capacity of 190 MMBtu/hr) are assumed to be used for WTA space heating during the winter season only. In accordance with the construction phasing plans, the proposed Westside CUP facility would be constructed and operational by 2005. The SCAQMD BACT Guideline emission factors were used to determine the proposed Westside CUP NO_x and CO emissions. AP-42 Volume 1 emission factors were used to determine the PM_{10}, VOC, and SO_2 emissions from the proposed Westside CUP.

Fire Training Facility

Air pollutants from training fires used in emergency fire fighting drills include PM_{10}, CO, NO_x, SO_2, and VOC. The emissions depend upon the type of fuel burned and the duration of the burn (quantity of fuel burned). Emissions from training fires were calculated for environmental baseline conditions using the methodology described previously in this section for combustion sources. The training frequency and quantity of fuel burned was obtained from the Aircraft Rescue and Fire Fighting (ARFF) department at LAX. LAWA intends that future training fire operations be located off-airport and outside of the South Coast Air Basin. Since training fires will be located outside the vicinity of LAX, they were not included in the future year emissions inventories for all of the alternatives.

Engine Test Facilities

Run-up testing of aircraft engines can occur at various locations around the airside portion of the airport property. For all alternatives, engine testing is assumed to be performed from aircraft on the ground at fixed locations with engine exhaust pointed toward blast gates. For the three build alternatives, ground run-up enclosures (GRE) are also constructed for engine maintenance and testing. Emissions for these facilities were determined following the methodology described for aircraft emissions using activity levels and TIM data provided for the LAX Master Plan.

Other Sources

Combustion source types at the on-airport flight kitchens and restaurants include the boilers, cooking facilities, emergency engines, and one power-producing natural gas-fired stationary internal combustion engine. The emissions from boiler/heater/cooking facilities were calculated based on the environmental baseline emissions inventory, assuming growth that is representative of their assigned source category. In addition to the natural gas combustion emissions, restaurants and flight kitchens have PM_{10} and VOC emissions from charbroiling and deep fat frying. On-airport restaurants are grouped separately from flight kitchen facilities due to their physical separation on the airport and because they are the only source to use wood as fuel for charbroiling, which requires a specific emission calculation procedure. The PM_{10} and VOC emissions from charbroiling and deep fat frying were estimated using SCAQMD emission factors.[34]

Combustion source types found in maintenance facilities included emergency engines, miscellaneous non-GSE engines, and boilers/heaters.

Organic Liquid Storage and Transfer

Large quantities of organic liquids, primarily fuels, are stored and handled at LAX. Activities that contribute VOC emissions include those associated with tank filling and emptying (working losses), changes in ambient temperature/pressure (breathing losses) at each storage tank, and equipment fueling (fugitive losses). By volume, the main organic liquid handled at LAX is Jet A fuel. Storage facilities consist of large above ground tanks and numerous smaller above ground and underground tanks. These

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[34] South Coast Air Quality Management District, Staff Report for Proposed Rule 1138 – Control of Emissions from Restaurant Operations, 1997.

tanks are filled either by an underground pipeline or by tanker truck. Fueling of aircraft from these tanks is either by transfer through the underground pipeline to the hydrant system or by tanker truck. Aviation gasoline (AvGas) is also stored and handled at LAX. Storage facilities for AvGas consist of a single aboveground tank. This tank is filled by tanker truck. AvGas is used by piston-driven general aviation aircraft at LAX. Fueling of piston-driven aircraft is generally by tanker truck.

Gasoline and diesel are stored on the airport in numerous aboveground and underground tanks, which are considerably smaller than the tanks used to store Jet A fuel. Tanker trucks typically fill these tanks. Fueling of on-road and nonroad vehicles, including GSE, with gasoline or diesel is generally accomplished from permanent fuel dispensing stations.

The fuel storage and transfer operations include the main aircraft fuel storage and refueling operations, as well as on-airport maintenance facility and rental car facility gasoline tank storage and refueling. Storage tank requirements in the SCAQMD Rules and Regulations[35] and the SCAQMD BACT Guidelines were addressed in the emissions estimates for this air quality analysis.

Emissions from the large aboveground jet fuel storage tanks (i.e., LAXFUEL Fuel Farm) were calculated using SCAQMD's emission inventory calculation procedure for internal floating roof tanks,[36] which is almost identical to USEPA's TANKS Version 4.3 emissions estimation program.[37] Fuel farm related transfer losses were accounted for using methods presented in AP-42 Volume 1. These transfer losses primarily occur during the filling of fuel tanks, fuel tank trucks, aircraft, and GSE. Emissions from underground or small aboveground gasoline tanks were calculated using CARB-approved emission factors for Stage I and Stage II vapor control.

The emissions estimates for future years consider storage tank type (floating or fixed roof), fuel type, fuel throughput, and tank-specific characteristics (diameter, color, breather vent settings, etc.). The LAX Master Plan specifies new or expanded fuel farms for the three build alternatives, including relocation off-site for Alternative B in the 2015 horizon year. A number of gasoline tanks found during the environmental baseline survey, including all on-airport rental car facility tanks, were assumed to be removed under the build alternatives.

Surface Coating and Solvent Usage

Surface coating and solvent degreasing are performed in maintenance areas, as necessary, for the repair and upkeep of aircraft/aircraft parts, motor vehicles/GSE, and miscellaneous airport-related equipment. Additionally, architectural coatings are used for the repair and upkeep of signs and buildings.

Surface coating operations emit VOC into the atmosphere through evaporation of the vehicle paint, thinner, or solvent used to facilitate the application and through clean up of the coatings. PM_{10} emissions are assumed to be minimal due to paint booth filter control in spray booths and high efficiency application methods used for outdoor/architectural painting. Emissions of VOC from surface coating operations were calculated using methods recommended in FAA's Air Quality Procedures, taking into account requirements in the SCAQMD Rules and Regulations and the SCAQMD BACT Guideline:

$$E_{VOC} = {}_i\Sigma[Q_i \text{ x } VOC_i \text{ x } (1-CF/100)]$$

Where:

E_{VOC} = total VOC emissions from painting operations (grams)

${}_i\Sigma$ = summation through coating types i

Q_I = total quantity of coating type i used in inventory period (kiloliters)

OC_i = VOC content for coating type i (grams VOC/kiloliter)

CF = air pollution control factor (%)

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[35] South Coast Air Quality Management District, Rules and Regulations, 1997.

[36] South Coast Air Quality Management District and Ecotek,, AQMD 1998-1999 Emissions Inventory Reporting Program, Available: http://www.ecotek.com/aqmd.htm [May 23, 2000].

[37] U.S. Environmental Protection Agency, Office of Air Quality Planning and Standards, User's Guide to Tanks. Storage Tank Emissions Calculation Software, Version 4.3, 2000.

Information regarding the types and quantities of coatings used at on-site facilities, in addition to any air pollution control information, was based on the environmental baseline emissions inventory survey. The VOC contents of coatings and solvents were obtained from Material Safety Data Sheets (MSDS), with default values from FAA's Air Quality Procedures used when MSDS information was unavailable. The VOC limits specified in SCAQMD Rules and Regulations and SCAQMD BACT Guideline were also accounted for during the emission inventory development. The inventory does not account for any architectural coating applications or runway/taxiway striping at LAX performed during construction.

The use and storage of organic degreasing solvents, such as chlorinated hydrocarbons, petroleum distillates, ketones, and alcohols, results in the evaporation of VOC or other hydrocarbons. Spent degreasing fluids are generally collected and disposed of at a properly licensed treatment, storage and disposal (TSD) facility. Emissions from solvent degreasing operations were based on the assumption that the total amount of solvent used would either be disposed of as waste liquid, or released into the atmosphere as evaporated VOC. Emissions from solvent degreasing were calculated using methods recommended in FAA's Air Quality Procedures:

$$E_{VOC} = D \text{ x } (QC\text{-}QD)$$

Where:

E_{VOC} = VOC emissions from the solvent degreasing unit (grams)

D = density of the solvent (grams/kiloliter)

QC = quantity of solvent consumed during a given time period (kiloliter)

QD = quantity of solvent disposal of as liquid in a given time period (kiloliter)

Quantities of consumed and disposed solvent were estimated for each alternative based on data from the environmental baseline emissions inventory survey. Sources and solvents that are not compliant with SCAQMD and USEPA regulations were eliminated from emissions inventories for 2005 and 2015. For water-based or other inorganic degreasers, it was assumed that evaporation of VOC does not occur. The VOC limits specified in SCAQMD Rules and Regulations and the SCAQMD BACT Guideline were accounted for when developing these emissions inventories.

Cooling Towers

Cooling towers (CT), used to remove heat from process cooling water, are sources of PM_{10}. The two largest CTs would be located at the existing CUP and the proposed Westside CUP. A number of smaller cooling towers are found in the maintenance and commercial facilities. Emissions calculations for cooling towers were based on the cooling tower re-circulation rate, water solids content, the particulate drift fraction, and the cooling tower type. AP-42 Volume 1 default factors were used when equipment/site-specific data were not available. The emission calculation methodology is as follows:

$$E_{PM_{10}} = {}_i\Sigma[(Q_i \text{x} SC_i \text{x} D_i \text{x} H_i \text{x} 8.34 \text{ lbs/gallon/1,000,000})]$$

Where:

$E_{PM_{10}}$ = total PM_{10} emissions from cooling towers (lbs/year)

${}_i\Sigma$ = summation through cooling towers i

Q_i = water re-circulation rate of cooling tower i (gallons/hour)

SC_i = water solids content for cooling tower i (ppm)

D_i = drift fraction of cooling tower i

H_i = hours of operation per year of cooling tower i (hours)

The proposed Westside CUP CT was assumed to run continuously, at 1.2 times the existing CUP CT water re-circulation rate with the same drift fraction as the existing CUP CT. Emissions from smaller CTs found at facilities that are not classified as CUPs (e.g., maintenance facilities, flight kitchens) were included in the emission totals for those source categories, unless that source was scheduled for removal from LAX.

Off-Airport Stationary Sources

Four major stationary sources located in the vicinity of LAX are the Chevron El Segundo Refinery, the Los Angeles Department of Water and Power (LADWP) Scattergood Generating Station, Southern California Edison (SCE) El Segundo Generating Station, and the Hyperion Treatment Plant. These four major sources are located along the Dockweiler State Beach shoreline in Los Angeles and El Segundo and are within a two-mile radius of the airport boundary. The refinery is a source of fugitive hydrocarbon emissions and combustion by-products during petroleum distillation. The Scattergood and El Segundo Generating Stations use natural gas as the primary fuel and No. 2 fuel oil as a backup, and the primary natural gas fuel is augmented by anaerobic digester biogas fuel piped from the Hyperion Treatment Plant. Criteria pollutants and toxic air pollutants are emitted during fuel combustion. Pollutants such as PM_{10} and disinfection byproducts are emitted from the Hyperion Treatment Plant and are transferred into the air at the air-water interface. Emissions from these sources are not included in this air quality analysis.

The consumption of electrical power at LAX would increase in the future. Although the Los Angeles Department of Water and Power (LADWP) distributes this electrical power to LAX, only approximately 27 percent of LADWP's electricity is generated from in-basin utility plants. The emissions associated with electricity consumed at LAX are widely distributed due to the practice of "wheeling" used by the electric utility industry. Also, the energy mix includes generation by hydroelectric, coal, renewable, and nuclear. For these reasons, emissions associated with increased usage of electrical power at LAX from any project alternative are not included in this air quality analysis.

2.1.3.3 Area Sources

Area sources associated with existing and future activities at LAX are composed of small emission sources. Area emissions are generated from commercial/residential natural gas consumption, nonroad engines used in landscaping applications, and deicing/anti-icing applications. Fugitive dust emissions from construction related activities and re-entrained dust from vehicular activity, generally treated as area sources, are discussed above.

Natural Gas Combustion

Emissions attributed to natural gas combustion were estimated using emission factors and the methodology outlined in the SCAQMD Handbook. The emission factors from this reference were applied to areas to be acquired under the LAX Master Plan and to existing area sources (residential and commercial units) that would be acquired and removed under the LAX Master Plan project alternatives.

Some land owned by LAWA adjacent to LAX is part of an approved LAX Northside development that has not yet been commercially developed. It is assumed that under the No Action / No Project Alternative in the 2005 and 2015 horizon years, commercial development in this area would progress under the approved LAX Northside EIR project (the EIR was approved in 1984). The Westchester Southside Development is a proposed collateral development project that is specified in the LAX Master Plan under the three build alternatives. The Westchester Southside development project would result in the commercial development of the existing property north of the northern runways. Emissions from the LAX Northside development are included in the No Action/No Project Alternative, and emissions from the Westchester Southside development are included in the three build alternatives.

Landscaping Equipment

Nonroad engines at LAX that are associated with area sources are used primarily in landscaping applications. The equipment used in landscaping applications include lawn mowers, weed trimmers, and leaf blowers. The equipment are fitted with small gasoline-fueled engines with low horsepower and are used intermittently. Emissions from these engines are considered negligible and are not included quantitatively in the emissions inventory.

Deicing/Anti-Icing

Since the climate at LAX is usually mild and the chance of frozen precipitation is extremely rare, it is assumed that icing of aircraft and runways/taxiways does not occur. In some instances deicing fluid is used on a small portion of aircraft arriving from the East Coast that have ice over the wing fuel tanks. For emissions estimation purposes, however, emissions attributed to the application of deicing/anti-icing materials are considered negligible.

2.1.4 Uncertainties and Sensitivities of Methods

The methods described herein and used to calculate the emissions presented below are sensitive to the values used to represent the numerous variables (e.g., assignment of a specific APU to a specific airframe). Consequently, the emissions values calculated using these methods are estimates, based on the various assumptions discussed above regarding forecasted future activities, and are therefore subject to the uncertainties inherent in developing the project input information. Different assumptions and values of variables would result in different emissions estimates. The CDM team has attempted to use well-accepted methods in a consistent manner to develop our best estimates of emissions, based on those particular assumptions discussed above.

2.2 Dispersion Modeling

Air dispersion modeling is used to predict ground-level ambient air concentrations of pollutants from known emission sources. Emissions estimates for each source category at LAX, discussed in the previous Section 2.1, *Emissions Estimates,* were input into air dispersion models to predict ground-level ambient concentrations at LAX and in the areas surrounding the airport. Concentrations of criteria air pollutants must be determined for the ambient air for areas to which the public has access. In addition, the point of maximum impact for each pollutant must also be determined. Modeling the concentrations at each point in a receptor grid was performed to assist in locating the maximum impact point. Sensitive receptor locations were identified near the LAX property and used in the air dispersion model for further analysis of human exposure to toxic air pollutants.

The on-airport dispersion analysis was conducted using EDMS 3.2 (released in February 2000) and the Industrial Source Complex-Short Term model (ISCST3); see Attachment A in Technical Report 4, *Air Quality*. EDMS 3.2 is the FAA-required model for airport air quality analysis, as noted in Section 2.1.3.1, M*obile Sources*. The ISCST3 model, as described in *User's Guide for the Industrial Source Complex (ISC3) Dispersion Models, Volumes 1 and 2*[38] (herein referred to as ISCST3 Users Guide), is a steady-state Gaussian dispersion model capable of estimating the short-term and annual concentrations from point, area, and volume sources. ISCST3 is a USEPA-preferred dispersion model as identified in USEPA's *Guideline on Air Quality Models (Revised)*[39] (herein referred to as the Guideline on Air Quality Models) and is identified as an available model by the FAA's Air Quality Procedures.

In accordance with FAA requirements, the preferred model used in the analysis was EDMS 3.2. EDMS 3.2 was used to predict CO, NO_x, and SO_2 concentrations from the on-airport mobile and stationary sources discussed in Section 2.1, *Emissions Estimates,* as well as concentrations of PM_{10} from on-airport mobile and stationary sources other than aircraft engines. Since EDMS 3.2 does not include emission or dispersion modeling capabilities for PM_{10} from aircraft engines, ISCST3 was used to predict PM_{10} concentrations from both aircraft engines and from runway and taxiway fugitive dust emission sources. PM_{10} emissions attributable to aircraft engines were calculated from emission indices developed for this study and PM_{10} attributable to fugitive dust sources was calculated using methods in the SCAQMD CEQA Handbook, as discussed in Section 2.1, *Emissions Estimates.*

The ISCST3 model was also used to estimate dispersion of emissions from construction sources. The FAA has indicated that ISCST3 is acceptable for modeling construction emissions at the airport.[40] Construction activities typically occur over a sizeable construction site; therefore, construction activities were modeled as area sources.

The only off-airport emission sources considered in the dispersion analysis were mobile vehicles. The CAL3QHCR model was used to model CO hot-spot concentrations at selected off-airport street intersections due to vehicle traffic. CAL3QHCR is a USEPA-developed model for analyzing CO concentrations at intersections.[41] The CAL3QHCR model allows the use of annual meteorological data

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[38] U.S. Environmental Protection Agency, User's Guide for the Industrial Source Complex (ISC3) Dispersion Models, Volumes 1 and 2, with Addenda (EPA-454/B-95-003a and b), 1995.

[39] 40 CFR 51, Appendix W. Guideline on Air Quality Models (Revised).

[40] Federal Aviation Administration, Meeting Summary, November 24, 1997.

[41] U.S. Environmental Protection Agency, Office of Air Quality Planning and Standards, User's Guide to CAL3QHC Version 2.0: A Modeling Methodology for Predicting Pollutant Concentrations Near Roadway Intersections (EPA-454/R-02-006 Revised), September 1995.

and one-week temporalized vehicle flow data. Additionally, it provides one-hour and running eight-hour CO concentrations for intersections and roadway links. The specific intersection and roadway links were selected based on results of the off-airport mobile-source emissions analyses conducted by the CDM team. The intersections with the greatest potential increase in project-related traffic, based on level of service and traffic volume, were included in the air quality analysis.

Since various dispersion models (EDMS 3.2, ISCST3, and CAL3QHCR) were used for different sources (on-airport, off-airport, and construction), results from parallel dispersion modeling of various sources were integrated to obtain the total impacts of the project. The maximum predicted screening concentration from each roadway segment was added to the maximum of the sum of the predicted concentrations of all other sources to obtain a conservative estimate of total concentrations. Additional refinements and integration were made to the results using USEPA's CALMPRO and USEPA's Tier 2 Ambient Ratio Method (ARM), which are discussed below.

2.2.1 Meteorological Data

Modeling was performed using meteorological data collected at LAX and obtained from the SCAQMD. The most recent set of complete meteorological data (surface and upper air) collected at LAX consists of hourly surface and upper air data from the LAX meteorological observation station operated by the SCAQMD for the 12-month period beginning March 1, 1996 and ending February 28, 1997.[42] The location of the meteorological station is shown on Figure 4.6-1, Meteorological Station and Air Quality Monitoring Station Locations, of the Draft EIS/EIR Section 4.6, *Air Quality.*

The meteorological data set included hourly values of air, dew point, and virtual temperatures; wind speed and direction; pressure; stability class; and mixing height. Meteorological data were extracted from the database, and rearranged to create a full calendar year (January 1 to December 31) compatible with the ISCST3 and EDMS 3.2 meteorological data input formats. Unit conversions were performed as needed. Where missing data occurred, the previous hour's data were used to fill in data. The electronic meteorological data file used in EDMS is provided in Attachment S in Technical Report 4, *Air Quality*. For dispersion modeling with EDMS 3.2, a constant mixing height of 542 meters (1,800 feet) was used based upon an average for the South Coast Air Basin.

2.2.2 Receptors

The receptors used in the air dispersion modeling analysis consisted of two types: grid receptors and discrete receptors. The grid receptors help define the model area and are evenly spaced within the airport boundary and in the area surrounding the airport. The grid receptors provide a concentration matrix that locate concentration peaks and the direction of air contaminant dispersion from the LAX emission sources. Discrete receptor points are individually placed receptors identifying contaminant concentrations at critical points beyond the LAX boundary. For the air dispersion modeling analysis critical points include locations sensitive to the public interest, air quality monitoring stations, and major traffic intersections. The goal in selecting receptor locations in the air dispersion models was to cover enough space for the models to predict pollutant concentrations at a sufficient number of publicly accessible locations and to supply enough detail to identify the maximum ambient air quality impacts associated with airport operations. The height of all receptors was set to 1.8 meters above ground level (EDMS default), the approximate breathing height of adults standing on the ground. Since the area around the airport has relatively flat terrain, all receptor terrain elevations were set to zero (0) meter.

Approximately 300 receptors were used in each EDMS 3.2 dispersion modeling scenario. A coarse receptor grid representing the modeling area with 500-meter spacing was used; any grid receptors that fell within the property line and within areas of LAX that are not accessible to the public were removed from the analysis. The coarse receptor grids were centered on the Theme Building, extending 4.5 kilometers to both the east and west and 5 kilometers to both the north and south from this central location. Additionally, discrete receptors were placed along the property line defined for each alternative, with no more than 300 meters between each receptor.

Approximately 1,100 to 1,400 receptors were used in each ISCST3 criteria pollutant dispersion modeling scenario. A 250-meter spacing was used for the coarse receptor grid in the ISCST3 criteria pollutant model runs. The ISCST3 criteria pollutant modeling grid extended 4 kilometers to the west, 5.5 kilometers to the east, and 2.5 kilometers to the north and south of the Theme Building. For the ISCST3 modeling

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[42] South Coast Air Quality Management District, SCAQMDMgt.mdb (Microsoft Access file), 1998.

analyses additional fine grids, spaced every 80 meters, were added to the northeast and east airport fence line. These additional fine grids were located off-airport based on the fence line of each alternative, and were developed to identify the maximum ambient off-airport concentration locations for PM_{10} and NO_x.

Approximately 800 to 1,000 receptors were used in each ISCST3 toxic air pollutant dispersion modeling scenario. A 1,000-meter spacing was used for the ISCST3 toxic air pollutant model runs in order to cover a large enough area for the toxic air pollutant assessment. The ISCST3 toxic air pollutant modeling grid extended 20 kilometers to the east, 6 kilometers to the west, 6 kilometers to the south and 10 kilometers to the north of the Theme Building. The fine grid receptors developed for the criteria pollutant modeling scenarios were included in the toxic air pollutant modeling scenarios to identify the maximum affected off-airport receptors.

Discrete receptors were placed at sensitive receptor locations within approximately 3 kilometers to the north and south, 8 kilometers to the east, and 6 kilometers to the west of the Theme Building. The sensitive receptors were used for the health risk analysis and include schools, hospitals, and nursing homes. For the criteria pollutant analysis, discrete receptors were placed at the SCAQMD Hawthorne and on-site LAX air monitoring stations to compare modeling results with existing ambient air quality in the model area. Additional discrete receptors were placed at the roadway intersections modeled with CAL3QHCR for the CO hot spots analysis. A listing of all discrete receptors modeled for the alternatives is presented in **Table 7**, Discrete Receptors used in the Air Quality Dispersion Modeling Analysis. The coordinates for all discrete receptors used in dispersion modeling are included so that the modeling results can be matched with the receptor name.

Table 7

Discrete Receptors used in the Air Quality Dispersion Modeling Analysis

Discrete Receptor Names	Receptor Locations, meters	
	X	Y
Public and Private Schools		
Acacia Baptist School	4,039	-3,069
Arena High School	-929	-2,157
Bennet-Kew Elementary School	6,464	-1,914
Boulah Payne Elementary School	4,145	829
Buford Elementary School	3,351	-762
Center Street Elementary School	-93	-2,145
Centinela Elementary School	3,719	3,116
Century Park Elementary School	7,644	-881
Chabad of the Marina	-4,165	1,766
Clyde Woodworth Elementary / Albert Monroe Middle	6,838	-491
Cowan Avenue Elementary School	-319	3,177
Crozier Middle School	4,287	2,159
El Segundo High School	-1,423	-2,191
El Segundo Middle School	-1,523	-2,190
Escuela De Montessori	744	1,375
Eucalyptus School	4,048	-2,436
Faith Lutheran Church School	6,749	1,805
Felton Elementary School	3,301	-354
Hawthorne High School	3,589	-2,900
Hillcrest Continuation School	3,681	1,485
Hilltop Christian School	-524	-2,714
Hudnall Elementary School	3,881	1,869
Imperial Ave. School Special Education Facility	-696	-1,578
Ingelwood Christian School	4,597	1,589
Inglewood High School	4,291	1,816
Jefferson Elementary School	4,113	-175
Juan De Anza Elementary School	2,893	-2,405
K-Anthony's Middle School	5,310	804
Kelso Elementary School	5,322	1,440
Kentwood Elementary School	-243	1,986
La Southside Christian Church	5,510	-236
Lennox Middle School	3,435	-1,119
Lindgren Partnership 1	3,686	1,981
Loyola Village Elementary School	-1,709	1,504
Trinity Lutheran Church Of Hawthorne	3,867	-3,245
Visitation Catholic School	-117	1,555
Warren Lane Elementary School	7,227	819
Washington School	4,779	-3,153
Westchester High School and Magnet Center	-2,465	1,496
Westchester Lutheran Church	628	2,792
Westpoint Heights Elementary School	1,310	2,551
Whelan Elementary School	5,128	-337
Worthington Elementary School	6,169	-1,109
York School	5,373	-1,985
Hospitals		
Robert F. Kennedy Medical Center	4,418	-1,851
Catholic Healthcare West Southern California	4,303	-1,738
Crippled Children's Society	6,668	2,390
Desco Health Care Inc	5,324	1,012
Daniel Freeman Memorial Hospital	5,268	2,532
Golden West Convalescent Hospital	3,832	-2,001
Centinela Hospital Medical Center	5,017	674
Convalescent and Nursing Homes		
C & H Health Care	4,843	3,196
Carewest Nursing Center	-2,686	1,677
Centinela Valley Care Center	5,177	697
Hawthorne Convalescent Center	4,431	-1,733
Klokke Corp	4,091	1,850
Mount Zion Baptist Church Of Los Angeles	4,374	3,483
Saint Erne Healthcare Center	3,442	2,311
Terrace Inglewood Brierwood	5,047	2,885
Urban Healthcare Project Inc	6,559	1,784
Traffic Intersection Receptors		
Airport Blvd. and Century Blvd.	1,524	132
Aviation Blvd. and Century Blvd.	2,225	120
La Cienega Blvd. and Arbor Vitae St.	3,017	919
La Cienega Blvd. and Century Blvd.	3,007	113
La Cienega Blvd. and I-405 Ramps N/O Century Blvd	3,007	388
La Cienega Blvd. and Florence Ave.	2,993	2,105

Table 7

Discrete Receptors used in the Air Quality Dispersion Modeling Analysis

Discrete Receptor Names	Receptor Locations, meters		Discrete Receptor Names	Receptor Locations, meters	
	X	**Y**		**X**	**Y**
Moffet Elementary School	4,929	-977	La Cienega Blvd. and Manchester Ave.	3,029	1,911
Morningside High School	6,245	-663	Lincoln Blvd. and Manchester Ave.	-1,528	1,746
Morningside United Church of Christ	7,097	1,531	Lincoln Blvd. and 83rd St.	-1,761	2,081
Musical Hart Evangelistic Assn	6,972	1,881	Lincoln Blvd. and La Tijera Blvd.	-1,227	1,383
Oak Street Elementary School	3,238	1,235	Sepulveda Blvd. and Imperial Hwy.	571	-1,446
Orville Wright Junior High School	-125	2,622	Sepulveda Blvd. and I-105 Off Ramp N/O Imperial Hwy	581	-1,250
Paseo Del Rey Magnet School	-2,899	1,446	Sepulveda Blvd. and Manchester Ave.	603	1,729
Saint Anthony's Catholic School	-546	-2,852	Sepulveda Blvd. and La Tijera Blvd.	595	1,440
South Bay Lutheran High School	6,163	-1,540	Sepulveda Blvd. and Mariposa Ave.	543	-2,286
St Eugene's Catholic School	7,913	632	Sepulveda Blvd. and Rosecrans Ave.	519	-4,685
St Joseph's Catholic Church School	4,772	-2,037	Vista Del Mar and Imperial Hwy.	-3,039	-1,416
St Mary’s Academy of L A	5,289	2,757	**Monitoring Station Receptors**		
St. Anastasia School	-2,137	1,622	SCAQMD Hawthorne Monitoring Station	2,942	-2,354
St. Bernard High School	-2,783	1,120	Project Ambient Monitoring Station	2,708	-409

Source: Camp Dresser & McKee Inc., 2000.

2.2.3 Land Use Classification

The USEPA's Guideline on Air Quality Models, Section 8.2.8, provides guidance on the selection of urban or rural dispersion coefficients to be used in dispersion modeling. The categorical classification scheme proposed by Auer[43] was used to determine the land use character in and around LAX. Descriptions of the urban land use classifications are provided in **Table 8**, Auer Land Use Classification Scheme. If land use types I1, I2, C1, R2, and R3 account for 50 percent or more of the area circumscribed by a 3-kilometer radius circle about the source, then urban dispersion coefficients (Briggs-McElroy-Pooler curves) are used. Rural dispersion coefficients (Pasquill-Gifford curves) are used when the urban land use is less than 50 percent. LAX itself is classified as I2, light-medium industrial, which would correspond to the use of urban dispersion coefficients. Additionally, an objective inspection of a 3-kilometer radius surrounding LAX indicates that the local land use is predominantly compact residential/commercial. Therefore, the urban dispersion coefficients were used in the air dispersion modeling analysis, where the respective models allow this selection. Note that the selection of urban dispersion coefficients in EDMS 3.2 is limited to aircraft in the takeoff mode, as well as stationary sources including GSE. EDMS 3.2 models aircraft taxi and queue as roadway sources using the dispersion coefficients developed for CALINE3.[44]

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[43] Auer, August H., Jr., Correlation of Land Use and Cover with Meteorological Anomalies, Journal of Applied Meteorology, 1978.

[44] Benson, Paul E., CALINE3 – A Versatile Dispersion Model for Predicting Air Pollutant Levels Near Highways and Arterial Streets, 1979.

Table 8

Auer Land Use Classification Scheme

Type	Use and Structures	Vegetation
I1	Heavy Industrial Major chemical, steel, and fabrication industries; general 3-5 story buildings, flat roofs	Grass and tree growth extremely rare; < 5% vegetation
I2	Light-Moderate Industrial Rail yard, truck depots, warehouses, industrial parks, minor fabrications; generally 1-3 story buildings, flat roofs	Very limited grass, trees almost absent; <5% vegetation
C1	Commercial Office and apartment buildings, hotels; >10 story heights, flat roofs	Limited grass and trees; <15% vegetation
R2	Common Residential Single family dwelling with normal easements; generally one story, pitched roof structures; frequent driveways	Limited grass and trees; <15% vegetation
R2	Compact Residential Single, some multiple, family dwelling with close spacing; generally < 2 story, pitched roof structures; garages via alley, no driveways	Limited lawn sizes and shade trees; <30% vegetation
R3	Compact Residential Old multi-family dwellings with close (<2m) lateral separation; generally 2 story, flat roof structures; garages (via alley) and ashpits, no driveways	Limited lawn sizes, old established shade trees; <35% vegetation
R4	Estate Residential Expansive family dwelling on multi-acre tracts	Abundant grass lawns and lightly wooded; >80% vegetation
A1	Metropolitan Natural Major municipal, state, or federal parks, golf courses, cemeteries, campuses; occasional single story structures	Nearly total grass and lightly wooded; >95% vegetation
A2	Agricultural Rural	Local crops (e.g. corn, soy bean); >95% vegetation
A3	Undeveloped Uncultivated; wasteland	Mostly wild grasses and weeds, lightly wooded; >90% vegetation
A4	Undeveloped Rural	Heavily wooded; >95% vegetation
A5	Water Surfaces	Rivers and Lakes

Source: Auer, August H., Jr., Correlation of Land Use and Cover with Meteorological Anomalies, Journal of Applied Meteorology, 1978.

2.2.4 CAL3QHCR Model for Local Roadway Intersections

Traffic volumes are predicted to increase in 2005 and 2015 by varying degrees throughout a large geographic area for the environmental baseline, the No Action/No Project Alternative, and the three build alternatives. The LAX Master Plan team provided traffic data for a total of 61 intersections, 30 roadway segments, 3 cross-sections of the I-405 freeway, 2 cross-sections of the I-105 freeway, and 39 freeway ramps. The traffic data was collected in November and December 1999. The data provided included information for all alternatives for the three peak hour periods (e.g., AM peak, PM peak, and AP).

Specific intersection one-hour and eight-hour CO concentrations for all alternatives for 2005 and 2015 were modeled using the CAL3QHCR dispersion model. Data input into the model include:

- Traffic volume
- Associated emission factors, calculated using Caltrans' version of the EMFAC7F model
- Meteorological data provided by SCAQMD for the LAX monitoring site.
- Site geometry and characteristics.

The CAL3QHCR model was selected because it is programmed to estimate local CO concentrations. The CAL3QHCR version of the CAL3QHC model was used because it allows the use of meteorological data and hourly traffic flows to determine the maximum one-hour and eight-hour CO concentrations. Hourly conversion factors were provided for the LAX Master Plan.[45] These factors were input into the model to calculate the hourly traffic flows based on AM, PM, and AP values.

CO levels throughout the South Coast Air Basin tend to be at their most concentrated during the winter months of December and January and during the hours between 6:00 AM and 8:00 AM. CO

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[45] Parsons Transportation Group Inc., Conversion Factors for Hourly VMT to Daily VMT, 2000.

concentrations are expected to peak during this period due to the combination of high traffic volumes during the early morning commute period coupled with the greater occurrence of surface inversion layers that limit the vertical mixing of automobile emissions. The airport peak traffic estimates (see Attachment Q to Technical Report 4, *Air Quality*) specifically reflect summertime traffic at the airport peak period, 11:00 AM to 12:00 noon. The AM and PM peak traffic estimate provides winter time peaks between 8:00 AM to 9:00 AM and 5:00 PM to 6:00 PM, respectively. Therefore, to model traffic conditions that are consistent with the season of maximum CO impacts, AM and PM peak traffic estimates were used to determine the intersections most affected.

To comply with Caltrans[46] CO modeling protocols specified by the SCAQMD,[47] four receptors (one at each "corner" of each intersection) were evaluated. Five selection criteria were used in determining which intersections were to be modeled. These criteria included: (1) increases in intersection congestion from the environmental baseline to the build alternatives (i.e., increases in vehicle-to-capacity [V/C] ratios); (2) overall congestion levels; (3) intersection location, to allow the determination of impacts to various communities surrounding the project area; (4) overall size/traffic flow of the intersection; and (5) proximity to on-airport CO emission sources (e.g., runway queues) in order to provide data to determine the combined on- and off-airport maximum CO impacts. The 17 selected intersections modeled for 2005 and 2015 impact assessment included the following:

- Airport Blvd. and Century Blvd.
- Aviation Blvd. and Century Blvd.
- La Cienega Blvd. and Arbor Vitae St.
- La Cienega Blvd. and Century Blvd.
- La Cienega Blvd. and I-405 Ramps north of Century Blvd.
- La Cienega Blvd. and Florence Ave.
- La Cienega Blvd. and Manchester Ave.
- Lincoln Blvd. and Manchester Ave.
- Lincoln Blvd. and 83rd St.
- Lincoln Blvd. and La Tijera Blvd.
- Sepulveda Blvd. and Imperial Highway
- Sepulveda Blvd. and I-105 Ramps
- Sepulveda Blvd. and Manchester Ave.
- Sepulveda Blvd. and La Tijera Blvd.
- Sepulveda Blvd. and Mariposa Ave.
- Sepulveda Blvd. and Rosecrans Ave.
- Vista Del Mar and Imperial Highway

Several of the intersections were selected due to their proximity to other intersections that were selected for modeling. The selection of adjacent intersections was warranted when intersection results can be affected by the traffic queues from that adjacent intersection. Specifically, the red-light queues from adjacent intersections can back up to the intersection of concern and vice-versa causing impacts that can be significantly worse than the impacts caused by a single intersection.

A summary of AM and PM peak V/C ratios for the selected intersections for the No Action/No Project Alternative and the three build alternatives is presented in **Table 9**, Volume to Capacity (V/C) Summary for Selected Intersections – 2005, and **Table 11**, Volume to Capacity (V/C) Summary for Selected Intersections - 2015. A summary of the incremental change in V/C ratios from the environmental baseline for the three build alternatives is presented in **Tables 10**, Incremental Change in Volume to Capacity (V/C) Ratios from No Action/No Project Alternative - 2005, and **Table 12**, Incremental Change in Volume to Capacity (V/C) Ratios from No Action/No Project Alternative - 2015.

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[46] California Department of Transportation, Transportation Project-Level Carbon Monoxide Protocol – Revised December, 1997 (UCD-ITS-RR-97-21), 1997.

[47] Hogo, Henry, South Coast Air Quality Management District, Personal Communication, December 21, 1999.

Table 9

Volume to Capacity (V/C) Summary for Selected Intersections - 2005

	Alternative							
	No Action/No Project		A		B		C	
Intersection	AM Peak	PM Peak	AM Peak	PM Peak	AM Peak	PM Peak	AM Peak	PM Peak
Airport Blvd. & Century Blvd.	0.665	0.544	0.829	0.732	0.42	0.566	0.56	0.598
Aviation Blvd. & Century Blvd.	0.757	0.99	1.073	0.858	0.998	1.23	1.431	1.012
La Cienega Blvd. & Arbor Vitae St.	0.854	0.749	0.833	0.67	1.271	0.867	1.129	0.952
La Cienega Blvd. & Century Blvd.	0.688	0.723	0.806	0.674	0.958	0.982	0.718	0.827
La Cienega Blvd. & I-405 Ramps N/O Century Blvd.	0.573	0.579	0.737	0.517	0.834	0.681	0.945	0.673
La Cienega Blvd. & Florence	0.689	0.723	0.806	0.674	0.958	0.982	0.718	0.827
La Cienega Blvd. & Manchester Ave.	0.663	0.763	0.697	0.693	0.677	0.82	1.057	0.727
Lincoln Blvd. & Manchester Ave.	0.704	1.008	0.741	1.258	0.844	1.308	1.004	1.199
Lincoln Blvd. & 83rd St.	0.965	1.083	1.081	1.174	1.043	1.206	1.385	1.148
Lincoln Blvd. & La Tijera Blvd.	0.46	0.514	0.655	0.807	0.642	0.783	0.772	0.593
Sepulveda Blvd. & Imperial Hwy.	0.797	1.001	1.058	1.552	1.254	1.721	0.919	1.715
Sepulveda Blvd. & I-105 Ramps	1.169	0.949	1.104	0.915	1.043	0.837	0.925	0.848
Sepulveda Blvd. & Manchester Ave.	0.888	0.952	1.051	1.088	1.039	0.951	0.822	0.926
Sepulveda Blvd. & La Tijera Blvd.	0.911	0.688	1.49	1.505	1.366	1.583	0.679	1.446
Sepulveda Blvd. & Mariposa Ave.	0.705	0.959	0.838	1.303	0.816	1.326	1.451	1.289
Sepulveda Blvd. & Rosecrans Ave.	1.537	1.705	1.646	1.595	1.546	1.674	1.836	1.671
Vista Del Mar & Imperial Hwy.	0.834	0.538	0.704	0.65	0.658	0.646	0.565	0.759

Source: PCR Services Corp., 2000.

Table 10

Incremental Change in Volume to Capacity (V/C) Ratios from No Action/No Project Alternative - 2005

	Alternative A		Alternative B		Alternative C	
Intersection	AM Peak	PM Peak	AM Peak	PM Peak	AM Peak	PM Peak
Airport Blvd. & Century Blvd.	0.16	0.19	(0.25)	0.02	(0.11)	0.05
Aviation Blvd. & Century Blvd.	0.32	(0.13)	0.24	0.24	0.67	0.02
La Cienega Blvd. & Arbor Vitae St.	(0.02)	(0.08)	0.42	0.12	0.28	0.20
La Cienega Blvd. & Century Blvd.	0.12	(0.05)	0.27	0.26	0.03	0.10
La Cienega Blvd. & I-405 Ramps N/O Century Blvd.	0.16	(0.06)	0.26	0.10	0.37	0.09
La Cienega Blvd. & Florence	0.13	0.08	0.06	0.07	0.78	0.09
La Cienega Blvd. & Manchester Ave.	0.03	(0.07)	0.01	0.06	0.39	(0.04)
Lincoln Blvd. & Manchester Ave.	0.04	0.25	0.14	0.30	0.30	0.19
Lincoln Blvd. & 83rd St.	0.12	0.09	0.08	0.12	0.42	0.06
Lincoln Blvd. & La Tijera Blvd.	0.20	0.29	0.18	0.27	0.31	0.08
Sepulveda Blvd. & Imperial Hwy.	0.26	0.55	0.46	0.72	0.12	0.71
Sepulveda Blvd. & I-105 Ramps	(0.06)	(0.03)	(0.13)	(0.11)	(0.24)	(0.10)
Sepulveda Blvd. & Manchester Ave.	0.16	0.14	0.15	(0.00)	(0.07)	(0.03)
Sepulveda Blvd. & La Tijera Blvd.	0.58	0.82	0.46	0.90	(0.23)	0.76
Sepulveda Blvd. & Mariposa Ave.	0.13	0.34	0.11	0.37	0.75	0.33
Sepulveda Blvd. & Rosecrans Ave.	0.11	(0.11)	0.01	(0.03)	0.30	(0.03)
Vista Del Mar & Imperial Hwy.	(0.13)	0.11	(0.18)	0.11	(0.27)	0.22

Source: PCR Services Corp., 2000.

Table 11

Volume to Capacity (V/C) Summary for Selected Intersections - 2015

	Alternative							
	No Action/No Project		A		B		C	
Intersection	AM Peak	PM Peak	AM Peak	PM Peak	AM Peak	PM Peak	AM Peak	PM Peak
Airport Blvd. & Century Blvd.	0.533	0.634	0.884	0.626	0.337	0.584	0.403	0.595
Aviation Blvd. & Century Blvd.	0.921	1.061	1.023	1.084	0.97	1.222	1.322	1.123
La Cienega Blvd. & Arbor Vitae St.	0.973	0.931	1.411	1.415	1.142	1.063	1.57	1.46
La Cienega Blvd. & Century Blvd.	0.745	0.825	0.807	0.89	0.867	0.984	1.082	1.054
La Cienega Blvd. & I-405 Ramps N/O Century Blvd.	0.574	0.519	0.768	0.593	0.763	0.787	0.7	0.686
La Cienega Blvd. & Florence	0.789	1.076	0.822	1.106	0.841	1.106	0.866	1.098
La Cienega Blvd. & Manchester Ave.	0.678	0.77	0.726	0.762	0.714	0.824	0.745	0.78
Lincoln Blvd. & Manchester Ave.	0.806	1.571	1.007	1.71	1.028	1.703	1.015	1.732
Lincoln Blvd. & 83rd St.	1.152	1.502	1.224	1.579	1.219	1.55	1.245	1.587
Lincoln Blvd. & La Tijera Blvd.	0.58	0.647	0.952	1.279	0.952	1.139	0.947	1.299
Sepulveda Blvd. & Imperial Hwy.	0.896	1.14	1.03	1.537	1.123	1.636	1.081	1.72
Sepulveda Blvd. & I-105 Ramps	1.241	1.023	1.132	0.981	1.081	0.915	1.13	0.863
Sepulveda Blvd. & Manchester Ave.	1.017	1.079	1.1	1.033	1.115	1.031	1.113	1.033
Sepulveda Blvd. & La Tijera Blvd.	0.864	0.924	1.317	1.775	1.385	1.824	1.284	1.749
Sepulveda Blvd. & Mariposa Ave.	0.803	1.094	0.936	1.471	0.929	1.466	0.908	1.484
Sepulveda Blvd. & Rosecrans Ave.	1.677	1.696	1.632	1.719	1.611	1.694	1.643	1.733
Vista Del Mar & Imperial Hwy.	1.12	0.793	0.916	0.941	0.931	0.901	0.91	0.988

Source: PCR Services Corp., 2000.

Table 12

Incremental Change in Volume to Capacity (V/C) Ratios from No Action/No Project Alternative - 2015

	Alternative A		Alternative B		Alternative C	
Intersection	AM Peak	PM Peak	AM Peak	PM Peak	AM Peak	PM Peak
Airport Blvd. & Century Blvd.	0.35	(0.01)	(0.20)	(0.05)	(0.13)	(0.04)
Aviation Blvd. & Century Blvd.	0.10	0.02	0.05	0.16	0.40	0.06
La Cienega Blvd. & Arbor Vitae St.	0.44	0.48	0.17	0.13	0.60	0.53
La Cienega Blvd. & Century Blvd.	0.06	0.07	0.12	0.16	0.34	0.23
La Cienega Blvd. & I-405 Ramps N/O Century Blvd.	0.19	0.07	0.19	0.27	0.13	0.17
La Cienega Blvd. & Florence	0.03	0.03	0.05	0.03	0.08	0.02
La Cienega Blvd. & Manchester Ave.	0.05	(0.01)	0.04	0.05	0.07	0.01
Lincoln Blvd. & Manchester Ave.	0.20	0.14	0.22	0.13	0.21	0.16
Lincoln Blvd. & 83rd St.	0.07	0.08	0.07	0.05	0.09	0.09
Lincoln Blvd. & La Tijera Blvd.	0.37	0.63	0.37	0.49	0.37	0.65
Sepulveda Blvd. & Imperial Hwy.	0.13	0.40	0.23	0.50	0.19	0.58
Sepulveda Blvd. & I-105 Ramps	(0.11)	(0.04)	(0.16)	(0.11)	(0.11)	(0.16)
Sepulveda Blvd. & Manchester Ave.	0.08	(0.05)	0.10	(0.05)	0.10	(0.05)
Sepulveda Blvd. & La Tijera Blvd.	0.45	0.85	0.52	0.90	0.42	0.83
Sepulveda Blvd. & Mariposa Ave.	0.13	0.38	0.13	0.37	0.11	0.39
Sepulveda Blvd. & Rosecrans Ave.	(0.05)	0.02	(0.07)	(0.00)	(0.03)	0.04
Vista Del Mar & Imperial Hwy.	(0.20)	0.15	(0.19)	0.11	(0.21)	0.20

Source: PCR Services Corp., 2000.

Emission factors for 2005 and 2015 were developed based on the EMFAC7F emission factor model, recommended for use in CO modeling by the SCAQMD. The composite emission factors reflect the vehicle mix and roadway speeds provided for the LAX Master Plan.

2.2.5 EDMS Model for Operations-Related Criteria Pollutants

The FAA requires the use of EDMS for all airport air quality analyses. A very detailed model, EDMS 3.2 requires the user to input information regarding all air pollutant emission sources typically found at an airport, including the sources discussed in Section 2.1.3, *Operations.* The EDMS 3.2 model was used to predict LAX operations-related criteria pollutant concentrations, except PM_{10} from aircraft.

2.2.5.1 Mobile Sources

Mobile sources modeled in EDMS 3.2 include aircraft, GSE, APUs, and GAV. EDMS 3.2 includes specific algorithms for the dispersion of emissions from aircraft in taxi/idle/queue and takeoff modes only. EDMS 3.2 is currently unable to model dispersion of emissions from aircraft climbout and approach modes. EDMS 3.2 includes GSE as point sources and GAV as roadway and parking lot sources.

Aircraft (Except Particulate Matter)

This section discusses the parameters and assumptions used to perform dispersion modeling of aircraft at LAX using EDMS 3.2.

Aircraft/Engine Combinations and LTOs

As discussed in Section 2.1.3.1, *Mobile Sources*, and shown in **Table 1** and **Table 2,** an appropriate engine for each airframe was included in the analysis. The engines selected for inclusion in the study accurately represent those available for the fleet for each horizon year. Annual LTOs were used for each aircraft type (see Attachment I in Technical Report 4, *Air Quality*) and appropriate temporal distributions were incorporated to reflect the hourly, daily, and monthly variations as noted above.

Runway/Taxiway/Queue/Gate Locations

Runway coordinates were obtained from the site layout drawings for the project alternatives using AutoCAD® and entered into EDMS 3.2. The full length of each runway was entered since EDMS 3.2 uses only the portion of the runway necessary for takeoff based on a linear interpolation of the aircraft takeoff speed and takeoff TIM for each aircraft size classification. EDMS 3.2 default takeoff TIM values are shown in **Table 4**, Aircraft Time in Mode.

Taxiway segment coordinates were also obtained from the site layout drawings for the project alternatives using AutoCAD®. EDMS 3.2 allows the user to specify up to three taxiways for each aircraft type. Therefore, the taxiway lengths were subdivided to allow EDMS 3.2 to account accurately for the reasonable movement of departing aircraft from gate to runway. Arrival taxi segments could not be included in the modeling analysis due to the three-taxiway assignment limitation. Taxiway TIM was calculated assuming an average aircraft taxi speed of 5.4 meters per second (12 miles per hour) for all aircraft types, estimated from SIMMOD data, for each defined taxiway segment length.

The coordinates defining the queue segments were based on the maximum aircraft queue depth, estimated from SIMMOD data, and site layout drawings for the project alternatives using AutoCAD®. As assigned in EDMS 3.2, the first queue endpoint always coincides with the location of the beginning of the runway. EDMS 3.2 allows one linear segment to define a runway's queue, therefore the second queue endpoint was assumed to be located on the main departure taxiway associated with each runway. The maximum length of each queue segment was calculated by assuming a distance of 66.6 meters (225 feet) per aircraft for the peak number of aircraft in queue for each runway. The SIMMOD data indicates that a maximum of approximately 40 aircraft per hour can depart from the main departure runways, which is equivalent to an average departure interval of 1.5 minutes per aircraft. Therefore, the maximum queue times were calculated assuming 1.5 minutes per aircraft for the peak number of aircraft in queue for each runway. Temporal factors specific to the queue for each runway in each alternative were also developed and incorporated into the analysis.

EDMS 3.2 allows each defined aircraft/engine combination to be assigned to one gate, one runway, and three taxiways. The SIMMOD data developed for each alternative analyzed over 200 gates and many more aircraft/gate/taxiway/runway combinations than could reasonably be accounted for in EDMS 3.2. Therefore, representative gate locations, taxiways, and runways were selected for each defined aircraft type in each alternative such that each terminal area was provided with an appropriate number of LTOs for each aircraft size category based on the SIMMOD data. Additionally, the aircraft assignments accounted for the SIMMOD-defined aircraft taxi departure movement from gates on the southern side of the airfield to north departure runways and from gates on the northern side of the airfield to south departure runways. The consolidation of each terminal into a single virtual gate conservatively combines the GSE and APU emissions for the dispersion analysis into a single location at each terminal.

Runway/Taxiway/Queue/Gate Assignments

To incorporate the taxi/idle and takeoff emissions accurately into EDMS 3.2, it was necessary to determine each aircraft's path from the assigned gate to the assigned departure runway. Earlier versions of EDMS (i.e., EDMS 3.0 and earlier) allowed the assignment of one gate, three taxiway segments, and one runway per individual aircraft type, i.e., a single aircraft type could not be assigned to more than one gate/ taxiway/queue/runway combination. Therefore, for earlier analyses performed using EDMS 3.0, duplicate user-defined aircraft were created for each aircraft in the study to allow the assignment of an aircraft type to multiple gate/taxiway/queue/runway combinations. EDMS 3.2 allows an individual aircraft/engine combination to be added to a study multiple times, removing the need to duplicate aircraft. However, the EDMS 3.2 modifications do not change the modeling results; therefore, recreating these studies, originally created in EDMS 3.0, was not necessary.

The gate and runway assignments for each aircraft type were obtained from an objective inspection of the SIMMOD data. Each aircraft type was assigned to a maximum of one northern and one southern departure runway. The goal of the aircraft assignments was to provide the correct number of daily departures for each runway. The SIMMOD departure data for VFR conditions were used to make the runway assignments, and all takeoffs were assumed to occur from east to west. Because the SIMMOD data indicate that most takeoffs would occur on the inboard runways (standard practice at LAX for large turbofan aircraft, primarily for noise mitigation), a simplifying assumption was made that most takeoffs occur on the inboard runways. Therefore, most aircraft takeoffs were assigned to runways 24L and 25R in proportion to the frequency of SIMMOD assignments to the northern and southern runways, respectively. Aircraft takeoffs were only assigned to the outboard or center runways if the SIMMOD data showed that an aircraft had zero operations on the inboard runways. No departures were assigned to the proposed new outboard runway that is defined for Alternatives A and B.

Similarly, the SIMMOD data for each aircraft type were inspected and aircraft were assigned to gates to provide a representative quantity of each aircraft size category at each terminal, and to provide taxi-out movements estimated from the SIMMOD data. Following the assignment of the runway and gate (terminal) for each aircraft type, up to three taxiways and a queue were assigned to each aircraft type to create a travel path from the gate to the assigned departure runway. See Attachment S in Technical Report 4, *Air Quality* for a list of runway/taxiway/queue/gate assignments for each alternative.

Aircraft Temporal Factors

EDMS 3.2 uses temporal factors to determine the annual number of LTOs from peak hourly LTOs for each aircraft type in the modeled fleet. A series of three temporal factors describing the time-based variability for each source was developed for the hour of the day, day of the week, and month of the year. The hour-of-the-day temporal factors are specific for each aircraft-runway combination modeled in each alternative and are determined directly from the SIMMOD data. The day-of-the-week and month-of-the-year temporal factors, which are assumed to be the same for all aircraft types in each alternative, were provided for the LAX Master Plan. Temporal factors were also developed for the aircraft queue lengths and times, as well as all stationary and roadway sources. The temporal factors are presented in Attachment D in Technical Report 4, *Air Quality*.

Ground Support Equipment/Auxiliary Power Units

The GSE and APU assignments associated with individual aircraft types are discussed in the calculation of aircraft-related emissions in Section 2.1.3.1, *Mobile Sources*. EDMS 3.2 assumes that emissions from aircraft-associated GSE emanate from a point located at the gate at which the aircraft is assigned, and that emissions from aircraft-associated APUs emanate from the associated aircraft at the assigned gate locations.

Ground Access Vehicles

EDMS 3.2 models on-road vehicle emissions as line sources, as opposed to volume sources that are used in the ISCST3 model. Since ISCST3 does not include the line source as a modeling option, the ISCST3 User's Guide recommends the use of volume sources to represent line sources in ISCST3. For input as line sources into the EDMS 3.2 model, the lengths and location of each roadway link were determined from the site layout drawings for the project alternatives using AutoCAD®. The CTA and WTA links have multiple levels. The emissions from all terminal roadway access levels were combined and modeled at ground level. This assumption provides a conservative estimate of impacts from the terminal roadway access links. The cargo ramp access links are located and modeled at ground level. The on-airport roadway link lengths used in EDMS 3.2 are provided in **Table 13**, On-Airport Roadway Source Modeling Parameters for Central Terminal, **Table 14,** On-Airport Roadway Source Modeling Parameters for West Terminal Area, and **Table 15,** On-Airport Roadway Source Modeling Parameters for Cargo/Ancillary Roadway Sources.

EDMS 3.2 models parking facilities as area sources. The project alternatives would include both ground-level parking lots as well as multi-level parking structures. The emissions were calculated for all levels but dispersion from multi-level parking structures was conservatively modeled as if they were ground-level sources. The approximate dimensions and locations of all on-airport parking areas were determined from the site layout drawings for the alternatives using AutoCAD®. The areas and number of on-airport parking facilities used in EDMS 3.2 for all alternatives are provided in **Table 16**, Parking Facility Modeling Parameters for No Action/No Project Alternative, Alternative A and Alternative B, and **Table 17**, Parking Facility Modeling Parameters for Alternative C.

Table 13

On-Airport Roadway Source Modeling Parameters for Central Terminal Area

	All Project Alternatives		
Link Name	**Link Length Miles**	**ISCST3 Volume Sources**	**Number of Lanes**
T1 (W)	0.326	20	6
T2 (W)	0.239	17	6
T3 (W)	0.134	9	6
TBIT (S)	0.145	8	6
T4 (E)	0.133	8	6
T5 (E)	0.111	7	6
T6 (E)	0.129	10	6
T7 (E)	0.191	12	6
T8 (E)	0.137	7	6
Skyway/N Sepulveda (S/N)	0.145	7	8
S. Sepulveda (S/N)	0.301	16	8
Century (W/E)	0.118	6	8
West Way (S/N)	0.152	11	4
East Way (S/N)	0.155	11	4
Center Way	0.683	58	4
CTA Loop	0.125	10	4

Source: Camp Dresser & McKee Inc., 2000.

Table 14

On-Airport Roadway Source Modeling Parameters for West Terminal Area

	Alternative A 2015			Alternative B 2015		
Link Name	Link Length Miles	ISCST3 Volume Sources	Number of Lanes	Link Length Miles	ISCST3 Volume Sources	Number of Lanes
N. Entrance (N/S)	0.564	17	8	0.475	19	8
Bypass Rd. (N/S)	0.418	31	7	0.474	31	8
Curbside N. (N/S)	0.148	6	8	0.166	7	8
Curbside N.C. (N/S)	0.113	5	8	0.150	6	8
Curbside C. (N/S)	0.154	6	8	0.141	6	8
Curbside S.C. (N/S)	0.072	3	8	0.051	2	8
Curbside S. (N/S)	0.128	5	8	0.168	7	8
RAC (N/S)	0.685	27	4	0.805	33	5
Remote N. (N/S)	0.437	18	4	0.465	19	5
Remote S. (N/S)	0.389	16	5	0.520	21	5
World Way W./Spine Rd. (W/E)	1.485	34	4	1.483	47	4

	Alternative C 2005				Alternative C 2015		
Link Name	Link Length Miles	ISCST3 Volume Sources	Number of Lanes	Link Name	Link Length Miles	ISCST3 Volume Sources	Number of Lanes
N. Entrance	0.492	20	8	N. Entrance	0.564	22	10
N. Bypass	0.327	20	8	Bypass Rd	0.418	45	7
S. Bypass	0.302	17	8	Connector N	0.148	15	10
N. Loop	0.334	14	5	Terminal W	0.113	26	4
Terminal E.	0.474	20	5	Terminal E	0.154	25	6
Curbside Idle E	0.342	14	2	Curbside Idle W	0.072	14	2
S. Loop	0.197	8	2	Curbside Idle E	0.128	14	2
RAC	0.560	23	3	RAC	0.685	20	4
Remote N.	0.421	17	8	Remote N.	0.437	11	8
Remote S.	0.324	14	8	Remote S.	0.389	18	8
				Spine Rd/World Way	1.485	48	4

Source: Camp Dresser & McKee Inc., 2000.

Table 15

On-Airport Roadway Source Modeling Parameters for Cargo/Ancillary Roadway Sources

	No Action/No Project 2005/2015			Alternative							
				A 2015		B 2015		C 2005[1]		C 2015	
Link Name	**Length Miles**	**ISC Volume Sources**	**Link Name**	**Length Miles**	**ISC Volume Sources**	**Length Miles**	**ISC Volume Sources**	**Length Miles**	**ISC Volume Sources**	**Length Miles**	**ISC Volume Sources**
Spine Road	1.219	20	RAMP 33.01	0.541	9	0.481	9	0.579	9	0.533	9
NECARGO 1	0.104	2	RAMP 33.02	0.213	4	--	--	0.124	2	0.232	4
NECARGO 2	0.091	2	RAMP 33.03	0.188	4	--	--	0.226	4	0.193	3
NECARGO 3	0.100	2	RAMP 33.04	0.119	2	--	--	0.097	2	0.127	2
NECARGO 4	0.286	5	RAMP 33.05	0.138	3	--	--	--	--	--	--
NECARGO 5	0.077	2	RAMP 34.01	0.467	8	0.391	7	--	--	0.474	8
NECARGO 6	0.254	5	RAMP 34.02	0.189	3	0.191	3	--	--	0.067	1
NECARGO 7	0.151	3	RAMP 34.03	0.175	3	0.176	3	--	--	0.067	1
NECARGO 8	0.265	5	RAMP 34.04	0.160	3	0.158	3	--	--	--	--
NECARGO 9	0.147	3	RAMP 34.05	0.144	3	--	--	--	--	--	--
NECARGO 10	0.216	4	RAMP35.01	0.286	5	0.163	3	0.169	3	0.512	9
SECARGO 1	0.316	5	RAMP35.02	0.390	7	--	--	0.083	2	--	--
SECARGO 2	0.262	4	RAMP35.03	0.250	5	--	--	0.181	3	--	--
SECARGO 3	0.260	4	RAMP 36.01	0.218	4	0.301	5	0.293	5	0.293	5
FEDXCAR 1	0.089	2	RAMP 36.02	0.251	5	--	--	0.261	4	0.255	5
FEDXCAR 2	0.130	2	RAMP 36.03	0.235	4	--	--	0.265	5	0.264	5
FEDXCAR 3	0.084	2	RAMP 37.01	0.193	4	0.522	9	0.230	4	0.176	3
SCARGO	0.194	4	RAMP 37.02	0.104	2	0.101	2	0.135	2	0.128	2
GARRETT	0.194	3	RAMP 37.03	0.106	2	0.100	2	--	--	0.106	2
SWCARGO	0.515	8	RAMP 37.04	0.258	5	0.100	2	--	--	0.251	5
SWANCIL	0.542	8	RAMP 37.05	--	--	0.099	2	--	--	--	--
			RAMP38.01	--	--	0.193	3	0.159	3	0.319	6
			RAMP38.02	--	--	0.356	6	0.308	6	--	--
			RAMP39	--	--	--	--	0.477	8	--	--
			RAMP41.01	0.335	6	0.214	4	0.180	3	0.352	6
			RAMP41.02	0.285	5	0.066	1	0.186	3	0.280	5
			RAMP41.03	--	--	--	--	0.112	2	--	--
			RAMP41.04	--	--	--	--	0.180	3	--	--
			RAMP42.01	--	--	0.393	7	0.099	2	0.299	5
			RAMP42.02	--	--	--	--	0.068	1	0.170	3
			RAMP 43.01	0.113	2	0.224	4	0.140	3	0.211	4
			RAMP 43.02	0.227	4	--	--	--	--	--	--
			RAMP 44.01	0.358	6	0.812	14	0.649	11	0.527	9
			RAMP 44.02	--	--	0.443	8	--	--	--	--
			RAMP 45	0.153	3	0.063	1	--	--	--	--
			RAMP46.01	0.184	3	0.252	4	0.407	7	--	--
			RAMP46.02	--	--	--	--	0.295	5	--	--
			RAMP46.03	--	--	--	--	0.104	2	--	--
			RAMP46.04	--	--	--	--	0.212	4	--	--
			RAMP46.05	--	--	--	--	0.227	4	--	--
			RAMP46.06	--	--	--	--	0.347	6	--	--
			RAMP47	--	--	0.168	3	0.267	4	0.262	5

[1] Alternative A and Alternative B in 2005 were assumed to be the same as Alternative C in 2005.

Source: Camp Dresser & McKee Inc., 2000.

Table 16

Parking Facility Modeling Parameters for No Action/No Project Alternative, Alternative A and Alternative B

	No Action/No Project 2005/2015				Alternative A 2015				Alternative B 2015			
Parking Facilities	**Area, m^2**	**ISCST3 Sources**	**EDMS Sources**	**Level**	**Area, m^2**	**ISCST3 Sources**	**EDMS Sources**	**Level**	**Area, m^2**	**ISCST3 Sources**	**EDMS Sources**	**Level**
CTA Structure 1 (P1)	12,375	2	1	4	12,375	2	1	4	12,375	2	1	4
CTA Structure 2 (P-2)	5,548	2	1	4	5,548	2	1	4	5,548	2	1	4
CTA Structure 2A (P-2A)	7,280	1	1	4	7,280	1	1	4	7,280	1	1	4
CTA Structure 3 (P-3)	7,800	2	1	4	7,800	2	1	4	7,800	2	1	4
CTA Structure 4 (P-4)	8,400	2	1	4	8,400	2	1	4	8,400	2	1	4
CTA Structure 5 (P-5)	6,912	1	1	4	6,912	1	1	4	6,912	1	1	4
CTA Structure 6 (P-6)	8,174	2	1	4	8,174	2	1	4	8,174	2	1	4
CTA Structure 7 (P-7)	20,880	3	1	4	20,880	3	1	4	20,880	3	1	4
East Side Staging	30,000	1	1	1	22,763	2	1	1	23,458	2	1	1
East Side RAC	168,000	2	1	1	135,318	2	2	1	---	---	---	---
East Side Remote Public	250,000	2	1	1	---	---	---	---	---	---	---	---
East Side Employee 1	486,612	1	1	1	54,349	1	1	1	54,339	1	1	1
East Side Employee 2	90,747	1	1	1	108,898	1	1	1	100,039	1	1	1
East Side Employee 3	---	---	---	---	146,996	1	2	1	30,741	1	1	1
East Side Employee 4	---	---	---	---	142,317	1	1	1	72,051	1	1	1
East Side Employee 5	---	---	---	---	7,328	1	1	1	220,000	2	2	1
West Terminal Close-in	---	---	---	---	63,996	10	3	6	87,846	10	3	6
West Side Staging	---	---	---	---	25,597	2	1	1	31,898	2	1	1
West Remote Public	---	---	---	---	74,159	5	3	4	123,100	5	3	3
West Side RAC	---	---	---	---	56,554	3	2	4	87,362	3	2	4

Source: Camp Dresser & McKee Inc., 2000.

Table 17

Parking Facility Modeling Parameters for Alternative C

	Alternative C 2005[1]				Alternative C 2015			
Parking Facilities	**Area, m^2**	**ISCST3 Sources**	**EDMS Sources**	**Level**	**Area, m^2**	**ISCST3 Sources**	**EDMS Sources**	**Level**
CTA Structure 1 (P1)	12,375	2	1	4	12,375	2	1	4
CTA Structure 2 (P-2)	5,548	2	1	4	5,548	2	1	4
CTA Structure 2A (P-2A)	7,280	1	1	4	7,280	1	1	4
CTA Structure 3 (P-3)	7,800	2	1	4	7,800	2	1	4
CTA Structure 4 (P-4)	8,400	2	1	4	8,400	2	1	4
CTA Structure 5 (P-5)	6,912	1	1	4	6,912	1	1	4
CTA Structure 6 (P-6)	8,174	2	1	4	8,174	2	1	4
CTA Structure 7 (P-7)	20,880	3	1	4	20,880	3	1	4
East Side Staging	19,642	2	1	1	19,642	2	1	1
East Side RAC	101,313	2	3	1	---	---	---	---
East Side Remote Public	---	---	---	---	---	---	---	---
East Side Employee 1	54,349	1	1	1	54,349	1	1	1
East Side Employee 2	103,231	1	1	1	174,363	1	1	1
East Side Employee 3	39,323	1	1	1	39,323	1	1	1
East Side Employee 4	38,839	1	1	1	38,839	1	1	1
East Side Employee 5	36,241	1	1	1	21,027	1	1	1
East Side Employee 6	8,930	1	1	1	36,241	1	1	1
East Side Employee 7	55,454	1	1	1	8,930	1	1	1
East Side Employee 8	44,889	1	1	1	55,454	1	1	1
East Side Employee 9	49,096	1	1	1	44,889	1	1	1
East Side Employee 10	7,328	1	1	1	49,096	1	1	1
East Side Employee 11	---	---	---	---	7,328	1	1	1
West Terminal Close-in	91,312	10	2	6	91,312	10	2	6
West Side Staging	---	---	---	---	10,975	2	1	1
West Remote Public	107,707	5	3	3	107,707	5	3	3
West Side RAC	---	---	---	---	79,258	3	2	4

[1] Alternative A and Alternative B in 2005 were assumed to be the same as Alternative C in 2005.

Source: Camp Dresser & McKee Inc., 2000.

2.2.5.2 Stationary Point Sources

Stationary sources associated with future activities at LAX include a variety of source types such as combustion units, coating and solvent activities (maintenance), organic liquid storage and transfer activities, and miscellaneous activities. Emissions estimates for these types of sources were calculated within EDMS 3.2 based on methodologies discussed in Section 2.1.3.1, *Mobile Sources*.

EDMS 3.2 models the dispersion from all stationary sources as point sources. Necessary information includes stack height and diameter, gas exit velocity and temperature, individual criteria pollutant emission rates, and annual or hourly fuel consumption or material throughput. EDMS 3.2 does not include the effects of building aerodynamics in the dispersion modeling of stationary point sources. Information obtained from the environmental baseline survey and other input for the LAX Master Plan were used to identify locations and operating parameters for these sources. Operating and structural information pertinent to the dispersion modeling of the stationary point sources at LAX are presented in **Table 18**, Stationary Source Modeling Parameters.

Table 18

Stationary Source Modeling Parameters

Source Category	Number of Sources[1]	Height, m	Temperature, ^{o}K	Velocity, m/s	Diameter, m
CUP CT	1-2	15	293	2	10
CUP (East, CTA)	1	12	450	14	1.5
CUP (West)	0-1	10	450	10	1
Engine Tests	1-5	4 or 12	561	0.5	10
Flight Kitchens	2-5	10	422	5	0.6
Maintenance	4	20	422	10	0.6
LAX Northside	0-1	15	422	10	0.6
Restaurants	4	15	320	5	2

[1] The number of sources in each category varies by alternative and year.

Source: Camp Dresser & McKee Inc., 2000.

Combustion Sources

Combustion units include boilers, generators, heaters, and food preparation equipment. The dispersion of emissions of NO_x, CO, SO_2, and PM_{10} from stationary combustion sources was modeled in EDMS 3.2.

Organic Liquid Storage and Transfer

Although EDMS 3.2 does calculate VOC emissions from the storage and transfer of organic liquids, dispersion modeling of these emissions was not performed using this model-. EDMS 3.2 is not configured to model dispersion of VOC since there are no National Ambient Air Quality Standards to which concentrations of VOCs are subject. While VOC concentrations are not subject to any ambient air quality standards, ISCST3 dispersion modeling of VOC emissions was performed in order to estimate toxic air pollutant concentrations for the human health risk assessment conducted as part of this EIS/EIR and included in Section 4.24.1, *Human Health Risk Assessment,* of the Draft EIS/EIR and Technical Report 14a, *Health Risk Assessment*. The VOC emissions from organic liquid storage and transfer, however, were not included in the ISCST3 modeling and are discussed further in Section 2.2.6, *ISCST3 Model for Criteria Pollutants*.

Surface Coating and Solvent Usage

Although EDMS 3.2 does calculate VOC emissions from surface coating and solvent usage areas, dispersion modeling of these emissions was not performed with this model. As noted above, EDMS 3.2 is not configured to model dispersion of VOC since there are no National Ambient Air Quality Standards to which concentrations of VOCs are subject. Maintenance activities generating VOC emissions from degreasing, painting, and solvent usage are included in the ISCST3 modeling analysis of toxic air pollutants.

Other

Particulate emissions produced by the cooling towers associated with both the existing CUP and the proposed Westside CUP were included in the EDMS 3.2 dispersion modeling. The cooling towers were assumed to produce no emissions of the other criteria pollutants.

2.2.5.3 Area Sources

EDMS 3.2 contains no methodology to perform dispersion modeling of fugitive area sources. Thus, those activities discussed in Section 2.1.3.3, *Area Sources*, resulting in fugitive emissions were not included in the EDMS 3.2 dispersion modeling.

2.2.5.4 Post Processing of EDMS Model Runs

EDMS 3.2 does not include a method for calculating average pollutant concentrations when the averaging time contains periods of calm winds (i.e., wind speed less than one meter per second) nor does EDMS 3.2 strictly follow USEPA recommendations for multiple-hour averaging. EDMS 3.2 produces overlapping multiple-hour running averages. According to 40 CFR 50, the short-term (i.e., those covering 24 hours or less) National Ambient Air Quality Standards (NAAQS) are not to be exceeded more than once per year at any location. Compliance with this rule is demonstrated by comparing the second-highest concentration at each location to the NAAQS. By using a running average, the calculation of this second-highest concentration for multiple hours will always include the highest hourly value, since the multiple-hour period will overlap that of the highest concentration. Therefore, the use of overlapping multiple-hour running averages for comparison to the NAAQS effectively negates the provision of the single exceedance per year. The solution to this inconsistency is to use block averaging of pollutant concentrations.

To address these issues, the USEPA model CALMPRO[48] was used to post process the raw EDMS 3.2 results. CALMPRO was the postprocessor for USEPA dispersion models developed in the 1980s, before these methods were incorporated into newer dispersion models. CALMPRO reads hourly concentration and meteorological data. The influence of calm periods is eliminated by zeroing hourly concentrations at all receptors if the corresponding hour of meteorological data is calm. Decalmed block average concentrations are then calculated as follows: (1) three-hour average: the program divides the sum of noncalm hours by 3; (2) eight-hour average: the program divides the sum of hourly contributions by the number of noncalm hours or by 6, whichever is greater; (3) 24-hour average: the program divides the sum of hourly contributions by the number of noncalm hours or by 18, whichever is greater; (4) annual average: the program divides the sum of hourly contributions by the number of noncalm hours. The program produces annual averages and the five highest one-, three-, eight-, and 24-hour average concentrations. CALMPRO was modified to read the EDMS 3.2 hourly concentration and hourly meteorological data files while leaving the averaging and decalming algorithms of CALMPRO unchanged. These final CALMPRO-processed EDMS 3.2 results were used for comparison to the NAAQS and other applicable requirements.

Because EDMS 3.2 models emissions of NO_x, but the NAAQS and CAAQS are for NO_2, a method must be used to convert NO_x to NO_2. The estimate of annual NO_2 concentrations incorporates the Tier 2 Ambient Ratio Method (ARM) recommended by USEPA in the Guideline on Air Quality Models for converting total NO_x to NO_2 values.[49] The annual average NO_2-to-NO_x ratio near LAX is approximately 0.42, based on SCAQMD analysis of three recent years (1994-1996) of data.[50] This ratio was used to convert the modeled annual NO_x concentration to an annual NO_2 concentration. For short-term concentrations, a 42 percent conversion of NO_x to NO_2 was also assumed.

2.2.6 ISCST3 Model for Criteria Pollutants

The Industrial Source Complex Short Term (ISCST3) model is designed to predict air contaminant concentrations for time periods that are less than or equal to one year. ISCST3 was used to model the dispersion of hydrocarbons for analysis of toxic air pollutants, PM_{10}, and NO_x. ISCST3 was used to model

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[48] U.S. Environmental Protection Agency, Office of Air Quality Planning and Standards, Calms Processor (CALMPRO) User's Guide, 1984.

[49] 40 CFR 51, Appendix W, Section 6.2.3.

[50] Chico, T., H. Wong and A. Schuler, Successes and Failures in Using the Ambient Ratio Method to Estimate Annual NO_2 Impacts, June 1998.

PM_{10} concentrations since EDMS 3.2 is not configured to calculate aircraft engine particulate emissions. ISCST3 was used to supplement the one-hour NO_2 dispersion analysis as discussed in the Air Quality Modeling Protocol for Criteria Pollutants (Attachment A to Technical Report 4, *Air Quality*). The results of these additional analyses are presented in Attachment Z to Technical Report 4, *Air Quality*.

2.2.6.1 Construction

This discussion addresses the methods used in the air dispersion modeling for the construction emissions associated with the alternatives. Dispersion modeling was conducted to assess concentrations of CO, NO_2, and PM_{10} produced during construction activities related to the alternatives. The LAX construction-related emissions inventory is presented in Section 4, *Modeling Results*, of this report. The dispersion modeling used the results from the construction emissions inventory, the proposed development areas for LAX, and meteorological information available from SCAQMD to estimate pollutant concentrations resultant from the construction activities. The results of this construction dispersion modeling were combined with other on-airport and off-airport modeling results to address the cumulative air quality impacts associated with the alternatives.

Construction activities create potential air pollutant impacts related to exhaust emissions and soil disturbance. Dispersion analyses were performed for CO and NO_2 from construction vehicle exhaust. Dispersion modeling was also conducted for PM_{10} from construction vehicle exhaust and soil disturbance by construction vehicles. SCAQMD Rule 403 provides a framework for PM_{10} control during substantial construction projects. The SCAQMD has not developed criteria to determine the significance of PM_{10} concentration levels due to demolition and construction activities. In the absence of established SCAQMD criteria, this analysis uses the NAAQS and the CAAQS at sensitive receptors to determine significance of the potential air quality impacts.

A receptor grid composed of 635 receptors extending 2 kilometers from the fence line with a grid spacing of 250 meters was used in the modeling. Additionally, 56 discrete fence-line receptors were established, and 3 school receptors were included in the model runs. These receptors were used to assess the potential impact of construction for PM_{10} for comparison to the NAAQS, the CAAQS, and the incremental change between the No Action/No Project Alternative and the three build alternatives.

The ISCST3 model was used for the dispersion of PM_{10} emissions from the construction and demolition activities. The model was used to estimate 24-hour and annual PM_{10} concentrations, one- and eight-hour CO concentrations, as well as one-hour and annual NO_2 concentrations at defined receptor locations. Emissions were modeled using the meteorological data supplied by SCAQMD from its LAX station. The data includes a full year of wind speed, wind direction, atmospheric stability, and mixing height information.

Construction emission estimates were allocated for the construction source areas for the three build alternatives and for the construction source areas of the No Action/No Project Alternative. Emissions were modeled based on the worst-case quarterly emission rate for each alternative, including the No Action/No Project Alternative.

2.2.6.2 Operations

The impacts of operational emissions from mobile, stationary, and area sources were modeled as described below.

Mobile Sources

The emissions from the LAX operations discussed in Section 2.1.3.1, *Mobile Sources*, were used in the dispersion modeling analysis.

Aircraft

Aircraft were modeled in ISCST3 as multiple volume sources (for PM_{10}), distributed in equal emission increments for each of four operational modes (taxi/idle, approach, takeoff, climbout) and for each of three aircraft sizes. These three aircraft sizes were defined as Small, Large, and Heavy. In the site layout drawings for each alternative, travel segments were determined for each mode of operation. The travel segments were created for the travel scenarios originating and ending at each terminal gate area and areas used for maintenance and cargo aircraft. Volume sources for aircraft were distributed along each travel segment representing aircraft acceleration and/or constant velocity. The number of sources used for each operational mode and each aircraft size is given in **Table 19,** ISCST3 Number of Sources for Aircraft Operation Modes.

The volume source height for all on-ground aircraft emissions was assumed to be one-half of the initial volume vertical dimension. The source heights for the in-air portion of the approach, takeoff, and climbout emissions were determined using the beginning and end heights for each mode, the velocity for each mode, and the FAA specified/calculated TIM.

Table 19

ISCST3 Number of Sources for Aircraft Operation Modes

Idle				
Taxi	**Queue**	**Approach**	**Climbout**	**Takeoff**
60	1 to 20	5	5	15

Source: Camp Dresser & McKee Inc., 2000.

The aircraft size cutoff points for Small, Large, and Heavy aircraft were based on both airframe and engine size as shown in **Table 20,** Assigned Aircraft Size for ISCST3 Modeling, and are consistent with similar aircraft size cutoff points established in EDMS 3.2. The grouping of aircraft by size in the ISCST3 dispersion model is a more accurate modeling methodology than grouping all aircraft located around the airport. Each aircraft size group has different emission properties (grams of emissions per kilogram of fuel) which are modeled more accurately in the different size groups than by averaging over all aircraft. The initial volume size was based on the initial dispersion coefficients presented in the EDMS Reference Manual Supplement.[51]

Table 20

Assigned Aircraft Size for ISCST3 Modeling

Size	Aircraft	Engine Model No.	No. of Engines
Small	ATR42	PW121	2
	ATR72-200	PW124-B	2
	BAE146-300	ALF502R-5	4
	BH-1900	PT6A-65B	2
	BH-1900 Cargo	PT6A-65B	2
	Canadair RJ50	CF34-3A1	2
	Canadair RJ70	CF34-3A1	2
	DASH-7	PT6A-50	4
	EMB110KQ1	PT6A-27	2
	EMB-120	PW118	2
	FOKKER 50	PW125-B	2
	GenAvJet	JT15D-1	2
	GenAvProp	PT6A-67B	1
	GenAvProp Cargo	PT6A-67B	1
	Jetstream 31	TPE331-3	2
	Saab 2000	AE2100A	2
	SF-340A	CT7-5	2
	SHORT 360	PT6A-65AR	2
	Swearingen Metro 2	TPE331-3	2
Large	A319	CFM56-5A1	2
	A320	CFM56-5B4	2
	B727 Cargo	JT8D-15	3
	B727-200	JT8D-15	3
	B737-200	JT8D-9A	2

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[51] Federal Aviation Administration, Available: http://www.aee.faa.gov/aee-100/aee-120/EDMS/Updates.htm [July 27, 1998].

Table 20

Assigned Aircraft Size for ISCST3 Modeling

Size	Aircraft	Engine Model No.	No. of Engines
Heavy	B737-200C Cargo	JT8D-17A	2
	B737-300	CFM56-3C	2
	B737-400	CFM56-3C	2
	B737-500	CFM56-3C	2
	B757-200	PW2037	2
	B757-200 Cargo	PW2037	2
	DC9 Cargo	JT8D-17	2
	DC9-50	JT8D-17	2
	F-28-4000	RR SPEY-MK555	2
	FOKKER 100-100	TAY 650-15	2
	FOKKER 70	TAY620-15	2
	MD-80	JT8D-217A	2
	MD-80-87	JT8D-217	2
	MD-90-10	V2525-D5	2
	MD-90-95	BR700-710A1-10	2
	A300B	CF6-50C	2
	A300-C4-200 Cargo	CF6-50C2	2
	A310-200	CF6-80C2A2	2
	A310-200 Cargo	CF6-80C2A2	2
	A330	CF6-80E1A1	2
	A340-200	CFM56-5C2	4
	B747 Combination	PW4056	4
	B747-200	JT9D-7R4G2	4
	B747-200 Cargo	JT9D-7R4G2	4
	B747-400	PW4056	4
	B747-400 Cargo	PW4056	4
	B747-X	PW4056	4
	B767-200	JT9D-7R4D	2
	B767-200 Cargo	JT9D-7R4D	2
	B767-300	JT9D-7R4D	2
	B777-200	PW4084	2
	DC10-30	CF6-50C2	3
	DC10-30 Cargo	CF6-50C2	3
	DC8 Cargo	CFM56-2C5	4
	DC8-70	CFM56-2C5	4
	IL-96	PS-90A	4
	L1011-500	RB211-524B4	3
	MD-11	PW4460	3
	MD-11 Cargo	PW4460	3

Source: Camp Dresser & McKee Inc., 2000.

The emissions used for each aircraft source were based on the annual emissions calculated by the EDMS 3.2 emissions module, with the exception of PM_{10} which was calculated as noted in Section 2.1, *Emissions Estimates*, for each alternative and horizon year. The annual emissions are sorted by aircraft size category (i.e., Small, Large, and Heavy) and by operational mode, divided by the number of point sources used for each operational mode. The units are converted from tons/year into annual average emissions in grams/second. Temporal factors, calculated from the SIMMOD data for each alternative, were used to convert the annual average emissions to maximum hourly emissions.

The temporal factors used in ISCST3 modeling for taxi/idle, approach, takeoff, and climbout are based on the actual hourly data for departures and arrivals as appropriate for each aircraft type. The hourly temporal factors are used for aircraft operation modes in the ISCST3 modeling since ISCST3 allows only one set of scaling factors per run.

The hourly temporal factors for departure were used for operation in climbout and queue mode. The queue temporal factors were calculated, for each queue position, using the hourly number of each aircraft type passing through each queue point, and the average hourly depth of queue. The depth of queue was determined through analysis of the SIMMOD model results developed for the LAX Master Plan. Data showing the arrival, departure, and queue aircraft assignments by alternative and horizon year are presented in Attachment U in Technical Report 4, *Air Quality*. The depth of the queue for each runway is based on the number of aircraft in each queue during hourly intervals. Fractions in the queue depth represent aircraft moving through the queue in a shorter time interval.

The taxi temporal factors were determined for each taxi point based upon the location of the taxi segment in the site layout drawings for each alternative and horizon year. Taxi points in arrival and departure segments were assigned arrival or departure temporal factors, respectively. For taxi points in segments with cross-traffic, a combination of the departure and the arrival temporal factors for each aircraft size was assigned. The combined (mixed) arrival and departure temporal factors used for taxi sources is given in Attachment D to Technical Report 4, *Air Quality*.

Ground Support Equipment/Auxiliary Power Units

Emissions from GSE actually occur over a broad area of the airport as the emissions calculated for many of the service equipment types include emissions incurred from travel from a support facility to the gate being serviced. However, for simplification and conservatism, the emissions are grouped into area sources around separate gate areas for the different alternative gate layouts. The GSE are assumed to operate near the aircraft within a 30-meter width starting 5 meters from the edge of the terminal/structure. The length of the area source is defined as the length of each specific gate area. Specific maximum hourly emissions and temporal factors were used for each of these gate areas through analysis of the SIMMOD arrival and departure data. The APU emissions were included with the GSE emission sources.

GSE service aircraft that are arriving and departing from gate areas. Since the GSE operate for both arrivals and departures, mixed arrival and departure temporal factors for Small, Large, and Heavy aircraft were used. The GSE temporal factors are included in Attachment D to Technical Report 4, *Air Quality.*

Ground Access Vehicles

On-road vehicles on roadway links at the CTA, WTA, and cargo areas were modeled as volume sources as specified by the ISCST3 User's Guide. Since ISCST3 does not include line sources, the ISCST3 User's Guide recommends the use of volume sources for modeling purposes to represent line sources. The initial lateral dimension of the volume source was determined to be the mixing zone of each roadway (width of the roadway lanes plus three-meter mixing zones on either side) divided by 2.15 as specified in the ISCST3 User's Guide. This initial vertical dimension was determined from following the CALINE mixing height equations,[52] assuming a long-term average wind speed of 3.3 meters per second.[53] The vertical dimension is calculated as follows:

$$\sigma_z = 1.8 + 0.11 \text{ x TR}$$

Where:

σ_z = initial vertical dimension (meters)

TR = mixing time residence time (sec) = W2/U

W2 = highway half-width (assumed to be 3 lanes or ~ 10 meters)

U = wind speed (m/s; average wind speed assumed to be 3.3 m/s)

Therefore:

$$\sigma_z = 1.8 + 0.11 \text{ x } 10/3.3 = 2.1 \text{ m}$$

The roadway emissions in grams per second were calculated for each defined roadway segment presented in Section 2.1, *Emissions Estimates*. The temporal factors for roadways were used to calculate the short-term emissions for each link, in grams per second. The emissions calculated for each roadway link were divided evenly between the number of volume sources that comprise that segment, and temporal files calculated for the CTA and the WTA were applied to each of the volume sources. The traffic temporal files used in EDMS 3.2 modeling were used in the ISCST3 modeling analysis and are given in Attachment D in Technical Report 4, *Air Quality*.

The emissions from parking areas and structures were modeled as volume sources using the initial lateral and vertical dimension corrections provided by the ISCST3 User's Guide. Each parking structure/area

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[52] Benson, P.E., CALINE3 – A Versatile Dispersion Model for Predicting Air Pollutant Levels Near Highways and Arterial Streets, 1979.

[53] Gale Research, Climates of the States, Volume 1: Alabama-New Mexico, 1985.

was divided into squares or rectangles that defined the specific area to be modeled by each volume source. Some of the parking areas were nearly square and could be modeled using one volume source, while complex shaped parking structures/areas were divided into several equivalent volume sources. To determine the initial lateral dimension of each volume source, the side of the square area was divided by 4.3. The initial vertical dimension for multistory parking structures is the height of the parking structure divided by 2.15 as recommended by the ISCST3 User's Guide. The same initial vertical dimension that was used for the roadways (i.e., 2.1 meters) was applied for ground-level parking areas.

The maximum hourly emissions for each parking area were calculated based on the estimated maximum parking projections. The emissions calculated for each parking structure/area were divided evenly between the number of volume sources that comprise each parking structure/area. The parking temporal factors presented in Attachment D in Technical Report 4, *Air Quality* were used to calculate the emission rate in grams per second as part of the ISCST3 data input.

Stationary Point Sources

Dispersion modeling of the stationary source emissions discussed in Section 2.1, *Emissions Estimates* was performed based on the project source configurations and the source types found during the environmental baseline survey. Conservatively, and for simplification of dispersion modeling, emissions were combined into a single source (e.g., maintenance, flight kitchens, restaurants) for smaller source types found at single source facilities. Source locations were determined from a review of the proposed airport layouts for each alternative. Typical stack dimensions and heights were used for the specific source types and these stacks were then compared to assumed building heights at each stationary source location to assure engineering consistency of their relative heights. The stationary source modeling parameters used in ISCST3 are shown in **Table 21**, ISCST3 Stationary Source Modeling Parameters. The engine testing sites are included in the table since they were modeled as stationary point sources. The area source for the LAX Northside development was modeled as a stationary source for the No Action/No Project Alternative as discussed in Section 2.1.3.3, *Area Sources*, and is included in the table.

Table 21

ISCST3 Stationary Source Modeling Parameters

Source Category	Number of Sources[1]	Height, m	Temperature, °K	Velocity, m/s	Diameter, m
CUP CT	1-2	15	293	2	10
CUP (East, CTA)	1	12	450	14	1.5
CUP (West)	0-1	10	450	10	1
Engine Tests	1-5	4 or 12	561	0.5	10
Flight Kitchens	2-5	10	422	5	0.6
Maintenance	4	20	422	10	0.6
LAX Northside	0-1	15	422	10	0.6
Restaurants	4	15	320	5	2

[1] The number of sources in each category varies by alternative and year.

Source Camp Dresser & McKee Inc., 2000.

Engine testing sources, like the other aircraft operations, were modeled with ISCST3 as stationary sources. The locations and type of run-up engine testing enclosure were determined for the LAX Master Plan. For all alternatives, the vertical exit velocity after deflection from the blast gates has been conservatively estimated at 0.5 meter per second. The stack diameter is assumed to be 10 meters after deflection from the blast gate. The “stack” temperature is assumed to be the same as other aircraft engine sources (561°K). The release height for dispersion is assumed to be the height of the blast gate (4 meters) for the No Action/No Project Alternative and the height of the GRE (12 meters) for the build alternatives.

The emissions from organic liquid storage and transfer were not included in the ISCST3 modeling of VOCs used to estimate toxic air pollutant concentrations contained in Section 4.24.1, *Human Health Risk Assessment,* of the Draft EIS/EIR and Technical Report 14a, *Health Risk Assessment*. Fueling and storage emissions are almost exclusively from Jet A fuel. Emissions of Jet A vapor do not have significant quantities of the toxic air pollutants modeled, and the limited future operations of gasoline fueling would include vapor recovery and therefore result in minimal emissions of air toxics. For storage and transfer of natural gas (CNG/LNG) and propane, VOC emissions contain negligible air toxic pollutants. Under the maintenance source type, emissions of VOCs from the usage of degreasing agents, paints, and other solvents were included in the ISCST3 modeling analysis for partitioning into component toxic air pollutants.

Area Sources

The deicing/anti-icing and landscaping equipment area sources discussed in Section 2.1, *Emissions Estimates,* were not modeled in ISCST3 since the emissions from these sources were considered to be negligible.

2.2.6.3 Post Processing of ISCST3 Model Runs

Because the version of the ISCST3 model used in this analysis incorporates algorithms comparable to those of the CALMPRO routine discussed in Section 2.2.5.4, *Post Processing for EDMS Modeling Runs,* it was not necessary to perform any post processing of the ISCST3 modeling output to correct for treatment of calm hours. However, the modeled NO_x concentrations were adjusted using the ARM discussed in Section 2.2.5.4, *Post Processing for EDMS Modeling Runs*, to generate NO_2 concentrations.

2.2.7 Uncertainties and Sensitivities of Methods

Dispersion models used in this analysis represent the state of the art in modeling methodology and guidance extant at the time of the analysis, and therefore, the results provided by exercising these models offer the best estimates available to predict future ambient concentrations, given the accuracy of the input data. That is not to say that these models are without limitations. Studies of model accuracy have consistently confirmed the following conclusions: (1) dispersion models are more reliable for predicting long-term concentrations than for estimating short-term concentrations at specific locations; and (2) dispersion models are reasonably reliable in predicting the magnitude of the highest concentrations occurring, without respect to a specific time or location. A comparison of modeled versus monitored data over a two-week period at LAX indicated that short-term (one-hour) impacts may be substantially over-estimated using approved airport modeling techniques. An approach to address this over-estimation was developed and included in Technical Report 4, *Air Quality* (Attachment A provides the approach and Attachment Z provides the results). We refer the reader to the Guideline on Air Quality Models[54] for additional discussion of dispersion modeling uncertainties and sensitivities.

2.3 Mitigation Measures

An extensive list of potential mitigation options for air quality was developed. The list was developed based on an evaluation of mitigation opportunities associated with the three build alternatives and from suggestions provided in public scoping comments. The list is presented in Attachment X in Technical Report 4, *Air Quality*. Those options that appear to have substantial or measurable air quality benefits were modeled. Quantification of mitigation measures is included in Section 4.6, *Air Quality* of the Draft EIS/EIR.

2.4 Future Background Concentrations

The modeling undertaken for the LAX Master Plan could not reflect all pollutant sources that contribute to total air pollutant levels in the area. Therefore, it was necessary to estimate future background concentrations that reflect the emissions from nearby and distant off-airport sources. These background concentrations, when added to the airport modeling results, reflect the predicted total ambient concentrations at a specific site.

Estimates of future year O_3 concentrations are based on regional modeling performed by SCAQMD and indicate that the airport area should not exceed the one-hour O_3 NAAQS and CAAQS through the year 2020. Therefore, SCAQMD predicts that the O_3 NAAQS and CAAQS will be attained and maintained in future years with or without the LAX Master Plan. The future background concentrations of CO, NO_2, and SO_2 near LAX in 2005 and 2015 were estimated using a linear rollback approach. This approach

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[54] 40 CFR 51, Appendix W. Guideline on Air Quality Models (Revised).

assumes that changes in emission inventories will change the background concentrations proportionally. The rollback equation is written as follows.[55]

$$C_p = \left[\left(C_b - k\right) \times \left(Q_p / Q_b\right)\right] + k$$

In this equation C_p and C_b are the future-year and existing-year concentrations, respectively, Q_p and Q_b are the future-year and existing-year emission rates, respectively, and k denotes natural background. The value of k was assumed to be negligible for NO_2,[54] CO, and SO_2.

The annual emissions inventories were used for estimating future year SO_2 background concentrations and the winter planning inventories[54] were used for estimating future year NO_2 and CO background concentrations. The existing emission rates for the South Coast Air Basin were taken from Appendix III of the 1997 AQMP[56] for 1997. The future year emission rates were taken from the controlled levels presented in Appendices III and V of the 1997 AQMP.[57, 58] The 2015 controlled emission rates were estimated from linear interpolation of the controlled emission rates for 2010 and 2020.

The future background concentration of PM_{10} at LAX was estimated by multiplying the current PM_{10} concentrations at the airport by the ratio of the future-year PM_{10} concentrations to the existing-year PM_{10} concentrations for downtown Los Angeles (nearest station for which future year PM_{10} concentrations had been estimated). This approach assumes that changes in PM_{10} concentrations at downtown locations are equivalent to changes in background concentrations in the LAX vicinity. For the future-year PM_{10} concentrations for downtown Los Angeles the values developed by SCAQMD[59] for the years 2000, 2006, and 2010 were used. The estimated value for 2005 was interpolated from data for 2000 and 2006, while the estimated value for 2015 was extrapolated using the least squares method from the available data. The calculated future background concentrations are presented in **Table 22**, Future Background Concentrations in 2005 and 2015.

Future background concentrations were estimated based on monitored ambient air quality measurements, which include the current contribution from LAX sources. Therefore, this methodology is conservative since airport sources are implicitly included in the calculated future background concentrations. To evaluate predicted ambient concentrations, the modeled airport contributions were added to the future background values and then these future total concentrations were compared to the NAAQS and CAAQS.

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[55] South Coast Air Quality Management District, Final 1997 Air Quality Management Plan – Appendix V, 1996.

[56] South Coast Air Quality Management District, Final 1997 Air Quality Management Plan – Appendix III, 1996.

[57] South Coast Air Quality Management District, Final 1997 Air Quality Management Plan – Appendix III, 1996.

[58] South Coast Air Quality Management District, Final 1997 Air Quality Management Plan – Appendix V, 1996.

[59] South Coast Air Quality Management District, Final 1997 Air Quality Management Plan – Appendix V, 1996.

Table 22

Future Background Concentrations in 2005 and 2015

Pollutant [2]	Averaging Period	Future Background Concentration [1] 2005	2015
O_3 (ppm)	One Hour	≤0.09[3]	≤0.09[3]
CO (ppm)	Eight Hour	4.9	3.4
	One Hour	6.2	4.2
NO_2 (ppm)	AAM	0.0196	0.0150
	One Hour	0.0998	0.0765
SO_2 (ppm)	AAM	0.0023	0.0027
	24 Hour	0.0065	0.0075
	Three Hour	0.016	0.018
	One Hour	0.019	0.022
PM_{10} (µg/m³)	AAM	28	24
	AGM	24	20
	24 Hour	61	43

AAM = Annual Arithmetic Mean.
AGM = Annual Geometric Mean.
ppm = parts per million (by volume)
µg/m^3 = micrograms per cubic meter

[1] Future background concentration were estimated using a linear rollback approach and future year controlled CO, NO_2 and SO_2 emission inventories from Appendices III and V of the 1997 AQMP (SCAQMD 1996b, 1996c). Future background concentrations of PM_{10} were estimated using the ratio of future year (SCAQMD 1996c) to current year PM_{10} concentrations for downtown Los Angeles applied to the current year PM_{10} concentration at LAX. Future background concentrations are based on monitored ambient air quality and therefore already include contributions from airport sources. Predicted future airport contributions were added to calculated future background concentrations to estimate future total concentrations. Consequently, this approach represents a conservative method for estimating future total concentrations.

[2] Lead (Pb) and sulfate concentrations currently meet the NAAQS and CAAQS limits. No significant sources of these pollutants exist or are proposed at LAX.

[3] Ozone concentrations with or without the proposed LAX Master Plan.

Source: Camp Dresser & McKee Inc., 2000.

3. ENVIRONMENTAL SETTING

3.1 Climatology

In the basins and valleys adjoining the coast of Southern California, climate is subject to wide variations within short distances because of the influences of topography on the circulation of marine air. The Los Angeles region offers a variety of climates within a few miles. Maximum July temperatures in Santa Monica average near 75°F while maximum July temperatures in the San Fernando Valley, just 15 miles north, average nearly 20°F warmer.

A dominating factor in the weather of California is the semi-permanent high pressure area of the north Pacific Ocean. This pressure center moves northward in summer, holding storm tracks well to the north, and minimizing precipitation. In winter, the Pacific high retreats southward, permitting storm centers to swing into and across California. When changes in the circulation pattern allow storm centers to approach California from the southwest, large amounts of moisture are carried ashore, resulting in heavy rains and widespread flooding during the winter months.

Water temperatures 200 to 300 miles offshore range from approximately 60° to 67°F. However, coastal upwelling of the cooler water from deeper subsurface levels off the coast of the Los Angeles region lower the coastal water temperature over a range of approximately 55° to 65°F. Comparatively warm, moist Pacific air masses drifting over this cool water often form a bank of fog that is generally swept inland by the prevailing westerly winds. This "marine layer," generally 1500 to 2000 feet deep, extends only a short distance inland, and rises during the morning hours, producing a deck of low clouds. The air above is usually relatively warm, dry, and cloudless.

The Los Angeles region receives only 10 to 15 inches of precipitation per year, on average. November through March marks the wet season in Southern California, with 83 percent of the annual rainfall occurring during these months. Thunderstorms are light and infrequent, and on very rare occasions, trace amounts of snowfall have been reported at LAX.

The Los Angeles region is almost completely enclosed by mountains to the north and east. The prevalent temperature inversion tends to prevent vertical mixing of air through more than a shallow layer. This location tends to produce a diurnal reversal of the wind direction – onshore during the day and offshore at night. With the region's concentration of industry, pollution tends to remain within this pattern and accumulates within the Basin. Winds aloft are generally from the west.[60]

3.2 Regulatory Setting

Regulatory agencies have established ambient air quality standards that determine acceptable levels of air quality to protect the public health and welfare. The attainment or nonattainment of ambient air quality standards influences the applicability of emission standards and other requirements in an air quality control region.

LAX is located within Los Angeles County in Southern California. The regulatory agencies with primary responsibility for air quality in the South Coast Air Basin include SCAQMD and CARB with oversight by USEPA Region IX.

3.2.1 Federal Regulatory Agency

The National Environmental Policy Act (NEPA) requires that the air quality impacts of the LAX Master Plan implementation be addressed. Regulatory guidance requires that the air quality impacts from the project be determined by identifying the project incremental emissions and air pollutant concentrations and comparing them to emissions thresholds, and state and federal air quality standards.

USEPA has established NAAQS for criteria air pollutants. These standards are applicable to the LAX area and are summarized in **Table 23**, Ambient Air Quality Standards. Each state is responsible for developing a state implementation plan (SIP) that provides for the attainment and maintenance of the NAAQS. LAX is in an air basin that is designated as being in nonattainment of the NAAQS for O_3, CO, and PM_{10}. The USEPA classifies the severity of the nonattainment status as "extreme" for O_3, "serious" for CO, and "serious" for PM_{10}. On July 24, 1998, the USEPA redesignated the nonattainment status for

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[60] Gale Research, Climates of the States, Volume 1: Alabama-New Mexico, 1985.

NO_2 to an attainment/maintenance status.[61] The area is in attainment of the NAAQS for SO_2 and lead (Pb).

Table 23

Ambient Air Quality Standards

			NAAQS	
Pollutant	**Averaging Time**	**CAAQS**	**Primary**	**Secondary**
Ozone (O_3)	Eight Hour	N/A	0.08 ppm (160 µg/m^3)	Same as Primary
	One Hour	0.09 ppm (180 µ/m^3)	0.12 ppm (235 µg/m^3)	Same as Primary
Carbon Monoxide (CO)	Eight Hour	9.0 ppm (10 mg/m^3)	9 ppm (10 mg/m^3)	N/A
	One Hour	20 ppm (23 mg/m^3)	35 ppm (40 mg/m^3)	N/A
Nitrogen Dioxide (NO_2)	Annual	N/A	0.053 ppm (100 µg/m^3)	Same as Primary
	One Hour	0.25 ppm (470 µg/m^3)	N/A	N/A
Sulfur Dioxide (SO_2)	Annual	N/A	0.030 ppm (80 µg/m3)	N/A
	24-Hour	0.04 ppm (105 µg/m3)	0.14 ppm (365 µg/m3)	N/A
	Three Hour	N/A	N/A	0.5 ppm (1300 µg/m3)
	One Hour	0.25 ppm (655 µg/m^3)	N/A	N/A
Particulate Matter (PM_{10})	AAM	N/A	50 µg/m^3	Same as Primary
	AGM	30 µg/m3	N/A	N/A
	24 Hour	50 µg/m3	150 µg/m^3	Same as Primary
Particulate Matter ($PM_{2.5}$)	AAM	N/A	15 µg/m^3	Same as Primary
	24 Hour	N/A	65 µg/m^3	Same as Primary
Lead (Pb)	Quarterly	N/A	1.5 µg/m^3	Same as Primary
	Monthly	1.5 µg/m^3	N/A	N/A
Sulfates	24 Hour	25 µg/m^3	N/A	N/A

AAM = Annual arithmetic mean.
AGM = Annual geometric mean.
ppm = parts per million (by volume)
µg/m^3 = micrograms per cubic meter
mg/m^3 = milligrams per cubic meter
N/A = Not applicable.
CAAQS = California Ambient Air Quality Standards.
NAAQS = National Ambient Air Quality Standards.

Source: U.S. Environmental Protection Agency, Region 9 Air Quality Maps, Available: http://www.epa.gov/region09/air/maps/maps-top.html [May 23, 2000]; California Air Resources Board, Area Designations (Activities and Maps), Available: http://www.arb.ca.gov/desig/desig.htm [May 23, 2000].

In July 1997, USEPA promulgated a new eight-hour O_3 NAAQS and new 24-hour and annual $PM_{2.5}$ NAAQS. In May 1999, the U.S. Court of Appeals for the District of Columbia Circuit remanded these standards to USEPA for reconsideration. Although the action of the court did not vacate the standards, they are currently considered unenforceable. On May 22, 2000, the U.S. Supreme Court agreed to hear the appeal of USEPA on the remand action. Since it is unlikely that the legality of these

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[61] Federal Register, Vol. 63, No. 142, July 24, 1998, pp.39747-39752.

specific NAAQS will be decided in the near future, they are not addressed further in this air quality analysis.

Section 176 (c) of the Clean Air Act requires that any entity of the federal government that engages in, supports, or in any way provides financial support for, licenses or permits, or approves any activity must demonstrate that the action conforms to the SIP. In this context, conformity means that such federal actions must be consistent with a SIP's purpose of eliminating or reducing the severity and number of violations of the NAAQS and achieving expeditious attainment of those standards. The general conformity regulations[62] apply to a federal action in nonattainment and maintenance areas if the total of direct and indirect criteria pollutant emissions from the action equal or exceed the de minimis amounts or the action is determined to be regionally significant. Because the FAA is required to approve a new airport layout plan pursuant to the final LAX Master Plan, the applicability of the general conformity regulations will be assessed for the preferred alternative and if applicable, FAA will issue a general conformity determination as a separate and stand-alone document. LAWA is also working with SCAQMD to include LAX emissions associated with the Master Plan in the emission budgets for the 2001 Air Quality Management Plan (AQMP). The transportation conformity regulations[63] apply to transportation plans, programs, and projects developed, funded, or approved by the Federal Highway Administration (FHWA) or the Federal Transit Administration (FTA) and sponsored by the local metropolitan planning organization (MPO). Elements of the LAX Master Plan that would require funding or approval of either the FHWA or the FTA must be part of a conforming regional transportation plan (RTP) or a regional transportation improvement program (RTIP) prepared by the MPO, in this case, the Southern California Association of Governments (SCAG). LAWA is working with SCAG to ensure that data developed for the Master Plan is taken into consideration in the preparation of future RTP and RTIP.

3.2.2 California Regulatory Agency

The California Environmental Quality Act (CEQA) and associated guidance requires that the air quality impacts be determined by comparing project incremental emissions and ambient air quality to emissions thresholds, and state and federal ambient air quality standards.

CARB has established CAAQS for criteria air pollutants. These standards are applicable to the South Coast Air Basin and are summarized in **Table 23**. CARB has designated the South Coast Air Basin as being in nonattainment of the CAAQS for O_3, CO, and PM_{10}. The South Coast Air Basin is in attainment of the CAAQS for NO_2, SO_2, Pb, and sulfates. CARB is the responsible agency in California for developing the SIP, which outlines the regulatory goals and plans for achieving the NAAQS in the state. With respect to the South Coast Air Basin, CARB incorporates approved elements of the SCAQMD AQMP into its SIP submittal to USEPA. CARB is also responsible for developing emission standards for on-road motor vehicles operated in California.

California environmental statutes identify and set requirements for toxic air contaminants. These statutes include the Air Toxics "Hot Spots" Information and Assessment Act (AB 2588) and the Toxic Air Contaminant Identification and Control Act of 1983 (AB 1807).

3.2.3 South Coast Air Basin Regulatory Agency

SCAQMD is the regional regulatory agency with direct oversight of ambient air quality within the South Coast Air Basin. In order to meet the NAAQS and CAAQS for air pollutants in the South Coast Air Basin, SCAMD has established rules and regulations applicable to stationary point sources to meet these standards. SCAQMD is responsible for developing a regulatory schedule and an AQMP to meet the NAAQS and CAAQS following the guidelines in the California SIP.

Every three years, SCAQMD must prepare and submit an AQMP to CARB that demonstrates attainment of the NAAQS by specified dates and that demonstrates reasonable progress toward attaining the CAAQS for the nonattainment pollutants. The plan includes extensive emissions inventories of all emission sources (including airports) in the South Coast Air Basin. CARB has approved the sections of the 1997 AQMP addressing NO_2 and CO. In 1999, SCAQMD proposed several amendments to the 1997 AQMP for O_3. On April 10, 2000, USEPA approved the most recent O_3 SIP, which is based on the 1997 AQMP.

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[62] 40 CFR 51, Subpart W, Determining Conformity of General Federal Actions to State or Federal Implementation Plans, .

[63] 40 CFR 51, Subpart T, Conformity to State or Federal Implementation Plans of Transportation Plans, Programs, and Projects Developed, Funded or Approved Under Title 23 U.S.C. or the Federal Transit Act.

The USEPA has not made a decision on the 1997 SIP for PM_{10}, and no previous PM_{10} SIPs have been approved by USEPA. One issue with the 1997 AQMP in regards to airports is an assumption made by SCAQMD that USEPA would adopt significant control regulations for aircraft engine emissions. Since USEPA did not adopt such regulations, and engine technologies are not capable of meeting the SCAQMD-assumed reductions, these AQMP inventories for airports underestimate actual existing airport emissions. The SCAQMD has begun developing emission inventories for the 2001 AQMP.

SCAQMD's New Source Review of Toxic Air Contaminants (Rule 1401) and Control of Toxic Air Contaminants from Existing Sources (Rule 1402) regulate toxic air pollutant emissions in the South Coast Air Basin and set requirements for air dispersion modeling and health risk analysis to ensure compliance with these regulations.

Since 1998, LAWA has been an active participant in a national effort to reduce aircraft and airport emissions. Stakeholders, including representatives from FAA, USEPA, state and local air quality agencies, environmental groups, air carriers, and airports, have been meeting on a regular basis to negotiate an agreement to reduce emissions from aircraft and airport-related sources. Although the focus of the discussions has been reducing NO_x emissions, consideration is also being given to limiting other pollutants generated by aviation activities, such as VOC, CO_2, PM and air toxics. This stakeholders' process is anticipated to result in a proposal for a national aviation emissions reduction program. (Note that this is a separate process from the consultation process that addresses GSE emissions discussed in Section 2.1.3.1, *Mobile Sources.*)

3.3 Ambient Air Quality

The existing ambient air quality in the vicinity of LAX describes the affected atmospheric environment for the LAX Master Plan. Emission sources at LAX are not the only sources that contribute to total air pollutant levels in the area. Nearby and distant off-airport sources also contribute to the total ambient concentrations. Air quality data from the closest SCAQMD air monitoring station and from a temporary air quality monitoring station placed at the airport were used to describe the affected environment.

3.3.1 Criteria Pollutants

The primary contaminants that regulatory agencies monitor and use to define air quality are called criteria pollutants. The criteria pollutants with national and California ambient air quality standards are O_3, CO, NO_2, SO_2, lead, sulfates, and PM_{10} as shown in **Table 23**.

Ozone is typically not emitted directly into the atmosphere but is formed in the atmosphere by photochemical reactions between precursor compounds in the presence of sunlight. Because O_3 is a secondary pollutant, it is addressed by use of surrogates, namely, VOCs and NO_x, the precursor compounds. Sulfate compounds are generally not emitted directly into the air but are formed through various chemical reactions in the atmosphere; thus sulfate is considered a secondary pollutant. Due to the complexity of sulfate formation mechanisms, all sulfur emitted by sources included in this air quality analysis was assumed to be released and to remain in the atmosphere as SO_2.

3.3.1.1 City of Los Angeles Data

Actual on-airport measurements of ambient air quality were undertaken for the LAX Master Plan to provide a context for the modeling of air pollutant concentrations in the vicinity of the airport. Where data were not actually measured at LAX, measurements collected by the SCAQMD at a nearby monitoring station were used. Ambient air quality monitoring was conducted on LAX property from August 13, 1997, through March 31, 1998.[64] The approximate location of the on-site monitoring station was approximately 1.6 miles (2.6 km) east-southeast of the LAX Theme Building, as shown on Figure 4.6-1, Meteorological Station and Air Quality Monitoring Station Locations, in the Draft EIS/EIR Section 4.6, *Air Quality*. Pollutants measured at the on-site monitoring station included CO, NO_2, SO_2, and PM_{10}. The final measurement report is included in Attachment Y of Technical Report 4, *Air Quality*. The data collection period included the summer, fall, and winter seasons. Therefore, these data were representative of both high O_3 periods (summer) and high CO and NO_2 periods (winter). The short-term (one-hour through 24-hour) average concentrations from the on-site monitoring station represent the environmental baseline

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[64] AeroVironment, Los Angeles International Airport Master Plan Phase IV, Environmental Impact Survey/Report Preparation Air quality and Meteorological Monitoring Programs – Measurements Report, 1998.

ambient air quality at LAX. The on-site ambient air quality conditions are briefly summarized in **Table 24**, Environmental Baseline Ambient Air Quality in the Vicinity of LAX.

Table 24

Environmental Baseline Ambient Air Quality in the Vicinity of LAX

Pollutant	Avg. Time	Baseline Air Quality	NAAQS/CAAQS
O_3 (ppm)	One Hour	0.13[2]	0.12 / 0.09
CO (ppm)	Eight Hour	8.5[3]	9 / 9.0
	One Hour	10.6[3]	35 / 20
NO_2 (ppm)	AAM	0.0305[2]	0.053/ -
	One Hour	0.15[3]	- / 0.25
SO_2 (ppm)	AAM	0.0027[2]	0.030/ -
	24 Hour	0.007[3]	0.14 / 0.04
	Three Hour	0.017[3]	0.50 / -
	One Hour	0.021[3]	/ 0.25
PM_{10} (µg/m³)	AAM	36[2]	50 / -
	AGM	34[1, 2]	- / 30
	24 Hour	82.3[3]	150 / 50
Pb (µg/m³)	Quarterly	0.05[1, 2]	1.5 / -
	Monthly	0.06[1, 2]	- / 1.5
Sulfates (µg/m³)	24 Hour	20.4[2]	- / 25

Note: Baseline conditions reflect actual measurements undertaken at LAX for the Master Plan. Where pollutants were not measured (O_3, Pb, sulfates, and annual averages) data collected by the SCAQMD at Monitoring Station 094 (about 2.3 miles southeast of the LAX Theme Building) were used, as noted below.

AAM = Annual Arithmetic Mean.
AGM = Annual Geometric Mean.
N/A = Not Available or Not Applicable.
ppm = parts per million (by volume).
µg/m^3 = micrograms per cubic meter.

[1] Less than 12 full months of data.
[2] Highest reported 1996 through 1998 concentrations from SCAQMD Monitoring Station 094, SW Coastal Los Angeles County.
[3] Highest measured concentration from on-site monitoring station.

Sources: AeroVironment, Los Angeles International Airport Master Plan Phase IV, Environmental Impact Survey/Report Preparation Air Quality and Meteorological Monitoring Programs – Measurements Report, 1998; South Coast Air Quality Management District, 1996 Air Quality (Summary), 1996; South Coast Air Quality Management District, 1997 Air Quality (Summary), 1997; South Coast Air Quality Management District, 1998 Air Quality (Summary), 1998.

3.3.1.2 SCAQMD Data

The SCAQMD maintains a network of air quality monitoring stations throughout the South Coast Air Basin. The monitoring location nearest to LAX is Station No. 094, Southwest Coastal Los Angeles County, located in Hawthorne. The approximate location of this monitoring station is roughly 2.4 miles (3.8 km) southeast of the LAX Theme Building and 0.60 mile (1.0 km) south of the LAX southeast property line, as shown on Figure 4.6-1, Meteorological Station and Air Quality Monitoring Station Locations, in the Draft EIS/EIR Section 4.6, *Air Quality*. Data from this station are used to describe environmental baseline O_3, Pb, and sulfate ambient concentrations as well as annual average NO_2, SO_2 and PM_{10} concentrations in the vicinity of LAX. These concentrations are also presented in **Table 24**. Since the Hawthorne monitoring station is not on-site, the highest O_3, Pb, sulfate, and annual average values from the previous three years[65, 66, 67] were used to describe the environmental baseline ambient air quality for these pollutants.

3.3.2 Toxic Air Pollutants

Toxic air pollutants include those contaminants listed in 40 CFR 63, Subpart B as hazardous air pollutants (HAP) as well as those contaminants that CARB identifies as toxic air contaminants (TAC). For purposes of this analysis, the toxic air pollutants are limited to those contaminants for which the California Office of Environmental Health Hazard Assessment (OEHHA) has developed unit risk factors or reference concentrations. The TAPA is summarized in Section 4.24.1, *Human Health Risk Assessment*, of the Draft EIS/EIR and details are included in Technical Report 14a, *Health Risk Assessment*. A brief study of the deposition of several toxic air pollutants was conducted in and around LAX. The deposition report, included in Attachment Y to Technical Report 4, *Air Quality*, concludes that direct correlations between the airport operations and deposition could not be determined.

3.4 Environmental Baseline Emissions Inventory

Developing emissions inventories for baseline conditions is one of the steps in the air quality impact analysis. This inventory for LAX-specific sources is summarized in **Table 25**, LAX Environmental Baseline Emissions Inventory for On-Airport Sources.

Table 25

LAX Environmental Baseline Emissions Inventory for On-Airport Sources [1]

Source Category	CO	VOC	NO_x	SO_2	PM_{10}
Aircraft Total, lbs/day	26,553	6,184	20,392	908	277
Aircraft Total, tpy	4,846	1,129	3,722	166	51
APU/GSE Total, lbs/day	31,669	1,107	2,306	44	70
APU/GSE Total, tpy	5,780	202	421	8	13
Stationary Total, lbs/day	1,604	786	3,278	39	294
Stationary Total, tpy	293	143	598	7	54
Motor Vehicles:					
MV, On-airport Total, lb/day	31,074	3,260	2,381	10	123
MV, On-airport Total, tpy	5,671	595	435	2	22
Fugitive Dust, Total lbs/day					107
Fugitive Dust, Total tpy					19
Total Operating, lbs/day	90,900	11,337	28.357	1,002	871
Total Operating, tpy	16,589	2,069	5,175	183	159

[1] The environmental baseline represents airport conditions in 1996.

Source: Camp Dresser & McKee Inc., 2000.

Air pollutant emissions are generated by a number of source types or categories at the airport. The majority of emissions at the airport were generated by the following source categories: aircraft; ground support equipment; motor vehicles; and various stationary sources including solvent usage, and organic liquid storage and transfer. Several miscellaneous source categories also generate emissions at the airport. The contribution of mobile sources (aircraft, ground support equipment, and motor vehicles) represents over 95 percent of all air pollutant emissions from LAX.

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[65] South Coast Air Quality Management District, 1996 Air Quality (Summary), 1996.

[66] South Coast Air Quality Management District, 1997 Air Quality (Summary), 1997.

[67] South Coast Air Quality Management District, 1998 Air Quality (Summary), 1998.

The major sources of CO emissions are aircraft engines (29 percent), APU/GSE (35 percent) and motor vehicles (34 percent). The major sources of VOC emissions are aircraft engines (55 percent) and motor vehicles (29 percent). Aircraft are the major source of NO_x emissions (72 percent) and SO_2 emissions (91 percent). The major sources of PM_{10} emissions are aircraft engines (32 percent), motor vehicles (14 percent), and stationary sources (34 percent).

4. MODELING RESULTS

This section tabulates the results of the air quality impact analyses of the No Action/No Project Alternative and the three build alternatives. The air pollutant emissions and associated concentrations during airport operations and construction are presented for each alternative and each horizon year. The discussion of the Environmental Consequences and Mitigation Measures are provided in Section 4.6, *Air Quality*, of the Draft EIS/EIR.

Table 26, Unmitigated No Action/No Project Alternative Operational Emissions Inventories for On-Airport Sources; **Table 27**, Unmitigated Alternative A Operational Emissions Inventories for On-Airport Sources; **Table 28**, Unmitigated Alternative B Operational Emissions Inventories for On-Airport Sources; and **Table 29**, Unmitigated Alternative C Operational Emissions Inventories for On-Airport Sources, present summaries of the inventories from on-airport sources in 2005 and 2015. **Table 30**, Unmitigated Operational Emissions Inventories for Off-Airport Sources in the South Coast Air Basin, presents summaries of the inventories from off-airport sources for the three build alternatives without mitigation and the No Action/No Project Alternative in 2005 and 2015. The adjusted environmental baseline emissions inventories are also included in this table. **Table 31**, Unmitigated Construction Emissions (Peak Daily, Peak Quarterly and Annual)--2005, 2015, and Peak Year, presents summaries of the construction emission source inventories for the three build alternatives, the No Action/No Project Alternative, and environmental baseline.

Table 26

Unmitigated No Action/No Project Alternative Operational Emissions Inventories for On-Airport Sources

Source Category	CO	VOC	NO_x	SO_2	PM_{10}
2005:					
Aircraft Total, tpy	6,070	1,173	4,854	213	60
APU/GSE Total, tpy	6,312	253	653	12	23
Stationary Total, tpy	112	82	199	6	34
On-Airport Motor Vehicles, tpy	3,953	461	394	3	46
Total Operating in 2005, tpy	**16,446**	**1,968**	**6,100**	**233**	**164**
2015:					
Aircraft Total, tpy	6,669	1,204	5,155	233	70
APU/GSE Total, tpy	5,785	245	673	11	24
Stationary Total, tpy	116	91	210	6	37
On-Airport Motor Vehicles, tpy	1,961	250	271	246	42
Total Operating in 2015, tpy	**14,530**	**1,789**	**6,308**	**252**	**173**

Source: Camp Dresser & McKee Inc., 2000.

Table 27

Unmitigated Alternative A Operational Emissions Inventories for On-Airport Sources

Source Category	CO	VOC	NO_x	SO_2	PM_{10}
2005:					
Aircraft Total, tpy	5,951	1,159	4,867	211	60
APU/GSE Total, tpy	4,211	206	407	4	6
Stationary Total, tpy	120	86	197	6	37
On-Airport Motor Vehicles, tpy	2,553	304	258	2	37
Total Operating in 2005, tpy	**12,835**	**1,756**	**5,728**	**223**	**140**
2015:					
Aircraft Total, tpy	7,339	1,279	6,526	275	78
APU/GSE Total, tpy	2,030	112	229	2	1
Stationary Total, tpy	138	104	233	7	48
On-Airport Motor Vehicles, tpy	1,507	188	188	3	46
Total Operating in 2015, tpy	**11,014**	**1,683**	**7,175**	**286**	**172**

Source: Camp Dresser & McKee Inc., 2000.

Table 28

Unmitigated Alternative B Operational Emissions Inventories for On-Airport Sources

Source Category	CO	VOC	NO_x	SO_2	PM_{10}
2005:					
Aircraft Total, tpy	5,951	1,159	4,867	211	60
APU/GSE Total, tpy	4,211	206	407	4	6
Stationary Total, tpy	120	86	197	6	37
On-Airport Motor Vehicles, tpy	2,458	298	257	2	35
Total Operating in 2005, tpy	**12,739**	**1,750**	**5,727**	**223**	**138**
2015:					
Aircraft Total, tpy	7,831	1,361	6,611	285	80
APU/GSE Total, tpy	2,011	113	229	2	1
Stationary Total, tpy	138	104	239	7	47
On-Airport Motor Vehicles, tpy	1,521	191	191	3	48
Total Operating in 2015, tpy	**11,500**	**1,769**	**7,270**	**297**	**175**

Source: Camp Dresser & McKee Inc., 2000.

Table 29

Unmitigated Alternative C Operational Emissions Inventories for On-Airport Sources

Source Category	CO	VOC	NO_x	SO_2	PM_{10}
2005:					
Aircraft Total, tpy	5,951	1,159	4,867	211	60
APU/GSE Total, tpy	4,211	206	407	4	6
Stationary Total, tpy	117	86	192	6	36
On-Airport Motor Vehicles, tpy	2,579	303	302	2	42
Total Operating in 2005, tpy	**12,858**	**1,754**	**5,767**	**223**	**144**
2015:					
Aircraft Total, tpy	7,656	1,318	6,190	273	75
APU/GSE Total, tpy	1,732	97	195	2	1
Stationary Total, tpy	124	96	207	6	41
On-Airport Motor Vehicles, tpy	1,629	200	176	3	50
Total Operating in 2015, tpy	**11,140**	**1,711**	**6,767**	**283**	**166**

Source: Camp Dresser & McKee Inc., 2000.

Table 30

Unmitigated Operational Emissions Inventories for Off-Airport Sources in the South Coast Air Basin, tons per year [1]

Pollutant	2005 Adjusted Environmental Baseline	Horizon Year 2005 Alternative NA/NP	A	B	C
CO	27,847	39,690	39,473	40,147	39,524
VOC	6,381	9,233	9,177	8,875	8,555
NO_x	3,993	5,583	5,403	5,723	5,700
SO_2	118	166	160	170	169
PM_{10}	180	255	374	386	383

Pollutant	2015 Adjusted Environmental Baseline	Horizon Year 2015 Alternative NA/NP	A	B	C
CO	13,331	20,898	25,568	25,488	25,393
VOC	4,985	8,536	9,090	8,992	8,906
NO_x	2,572	3,789	4,687	4,696	4,699
SO_2	121	178	223	224	205
PM_{10}	190	438	531	531	531

NA/NP = No Action/No Project Alternative.

[1] These inventories include emissions from on-road mobile sources within the South Coast Air Basin traveling to or from LAX.

Source: PCR Services Corp., 2000.

Table 31

Unmitigated Construction Emissions (Peak Daily, Peak Quarterly, and Annual)-- 2005, 2015, and Peak Year

	Year	CO	VOC	NO_x	SO_x	PM_{10}
Peak Day Emissions (lbs/day)						
No Action/No Project Alternative	2004[1]	13,253	12,785	3,274	1,857	2,169
	2005	5,267	7,792	3,215	698	556
	2015	---	---	---	---	---
Alternative A	2004[1]	19,407	3,893	26,522	3,509	12,064
	2005	13,635	2,764	25,703	2,446	7,338
	2015	4,107	789	3,533	678	2,738
Alternative B	2004[1]	22,209	4,455	30,352	4,015	13,806
	2005	15,604	3,162	29,415	2,798	8,398
	2015	4,699	902	4,043	776	3,133
Alternative C	2004[1]	20,106	4,033	27,478	3,635	12,499
	2005	14,127	2,863	26,630	2,533	7,602
	2015	4,254	817	3,660	702	2,836
Peak Quarterly Emissions (tons/quarter)						
No Action/No Project Alternative	2004[1]	431	416	106	60	71
	2005	171	253	104	23	18
	2015	---	---	---	---	---
Alternative A	2004[1]	883	178	1,207	160	547
	2005	621	126	1,170	112	334
	2015	187	36	161	31	125
Alternative B	2004[1]	1,011	203	1,381	183	625
	2005	710	144	1,338	127	382
	2015	214	41	184	35	143
Alternative C	2004[1]	915	183	1,250	165	566
	2005	643	130	1,212	115	346
	2015	194	37	167	32	129
Annual Emissions (tons/year)						
No Action/No Project Alternative	2004[1]	1,547	1,463	383	215	262
	2005	667	909	405	87	69
	2015	---	---	---	---	---
Alternative A	2004[1]	3,166	625	4,010	563	2,001
	2005	1,991	411	3,715	359	875
	2015	635	126	556	107	388
Alternative B	2004[1]	3,622	712	4,586	642	2,288
	2005	2,276	468	4,249	408	999
	2015	745	142	634	120	443
Alternative C	2004[1]	3,279	645	4,152	582	2,071
	2005	2,061	423	3,847	369	905
	2015	675	129	574	109	401

[1] Construction emissions for Alternatives A, B, C, and No Action/No Project peak in the year 2004.

Source: PCR Services Corp., 2000, March 1998.

Table 32, Unmitigated Peak Operational Concentrations for On-Airport Sources, presents summaries of the concentrations associated with each alternative in 2005 and 2015. The environmental baseline concentrations for each horizon year are also included in this table. Figure 4.6-2, Criteria Pollutant Peak Concentrations and Locations – No Action/No Project Alternative (2005) through Figure 4.6-7, Criteria Pollutant Peak Concentrations and Locations – Alternative C (2015) in Section 4.6, *Air Quality*, of the Draft EIS/EIR present the points of maximum impact for each pollutant for the three build alternatives in 2005 and 2015. **Table 33**, Unmitigated Local CO Concentrations at Off-Airport Intersections, presents summaries of the CO hot spots analysis for each alternative in 2005 and 2015. **Table 34**, Unmitigated Peak Construction Concentrations, presents summaries of CO, NO_2, and PM_{10} concentrations associated with each alternative in 2005 and 2015. The environmental baseline concentrations for each horizon year are also included in this table. Attachment V in Technical Report 4, *Air Quality* contains an analysis of the incremental emissions by alternative and year.

Table 32

Unmitigated Peak Operational Concentrations for On-Airport Sources (Including Background)

Pollutant (Conc. units)	Averaging Period	Environmental Baseline	Horizon Year 2005 Alternative NA/NP	A	B	C
CO (ppm)	Eight Hour	8.5	9.6	7.7	7.7	7.7
	One Hour	10.6	19.2	14.7	14.7	14.7
NO_2 (ppm)	Annual	0.0295	0.065	0.047	0.047	0.04
	One Hour [1]	0.15	1.69	0.90	0.90	0.90
SO_2 (ppm)	Annual	0.0025	0.0069	0.0050	0.0050	0.00
	24 Hour	0.007	0.020	0.019	0.019	0.01
	Three Hour	0.017	0.081	0.072	0.072	0.07
	One Hour	0.021	0.153	0.096	0.096	0.09
PM_{10} ($\mu g/m^3$)	AAM	36	46	42	42	42
	AGM	34	42	38	38	38
	24 Hour	82	97	96	96	96

Pollutant (Conc. units)	Averaging Period	Environmental Baseline	Horizon Year 2015 Alternative NA/NP	A	B	C
CO (ppm)	Eight Hour	8.5	6.1	5.7	6.7	6.7
	One Hour	10.6	18.3	16.1	19.9	18.5
NO_2 (ppm)	Annual	0.0295	0.056	0.04	0.049	0.042
	One Hour [1]	0.15	1.22	0.85	1.11	1.30
SO_2 (ppm)	Annual	0.0025	0.0069	0.00	0.0061	0.005
	24 Hour	0.007	0.020	0.02	0.023	0.023
	Three Hour	0.017	0.072	0.06	0.073	0.083
	One Hour	0.021	0.15	0.13	0.18	0.22
PM_{10} ($\mu g/m^3$)	AAM	36	44	37	34	37
	AGM	34	40	33	30	33
	24 Hour	82	81	69	63	66

AAM = Annual Arithmetic Mean.
AGM = Annual Geometric Mean.
NA/NP = No Action/No Project.
ppm = parts per million (by volume).
$\mu g/m^3$ = micrograms per cubic meter.

[1] Future concentration results from EDMS modeling. See Attachment Z to Technical Report 4, *Air Quality* for additional one-hour NO_2 modeling results.

Source: Camp Dresser & McKee Inc., 2000.

Table 33

Unmitigated Local CO Concentrations at Off-Airport Intersections (Including Background)

	Horizon Year 2005							
	No Action/ No Project, ppm		Alternative A, ppm		Alternative B, ppm		Alternative C, ppm	
Intersection	**1-Hr**	**8-Hr**	**1-Hr** [1]	**8-Hr** [2]	**1-Hr**	**8-Hr**	**1-Hr**	**8-Hr**
Airport Blvd. and Century Blvd.	6.5	5.0	6.8	5.1	6.7	5.1	6.6	5.1
Aviation Blvd. and Century Blvd.	6.6	5.0	6.4	5.1	6.7	5.3	6.7	5.3
La Cienega Blvd. and Arbor Vitae St.	6.4	4.9	6.4	5.0	6.6	5.1	6.6	5.1
La Cienega Blvd. and Century Blvd.	6.3	5.0	6.3	5.0	6.9	5.1	6.7	5.1
La Cienega Blvd. and I-405 Ramps N/O Century Blvd.	6.4	5.0	6.4	5.0	6.6	5.1	6.5	5.1
La Cienega Blvd. and Florence Ave.	6.4	5.0	6.6	5.1	6.7	5.2	6.6	5.2
La Cienega Blvd. and Manchester Ave/	6.1	4.9	6.4	5.0	6.6	5.2	7.0	5.2
Lincoln Blvd. and Manchester Ave.	6.8	5.2	6.5	5.1	6.6	5.2	6.6	5.1
Lincoln Blvd. and 83rd St.	6.6	5.1	6.4	5.0	6.5	5.0	6.5	5.0
Lincoln Blvd. and La Tijera Blvd.	8.4	6.3	6.5	5.1	6.6	5.2	6.5	5.1
Sepulveda Blvd. and Imperial Hwy.	6.2	4.9	6.6	5.1	7.0	5.2	6.6	5.2
Sepulveda Blvd. and I-405 Ramps	6.3	5.1	6.2	4.9	6.4	5.0	6.1	4.9
Sepulveda Blvd. and Manchester Ave.	6.8	5.0	6.9	5.3	6.8	5.3	6.7	5.2
Sepulveda Blvd. and La Tijera Blvd.	6.5	5.0	7.5	5.3	7.7	5.4	7.5	5.3
Sepulveda Blvd. and Mariposa Ave.	6.5	5.0	6.9	5.2	7.0	5.3	6.8	5.3
Sepulveda Blvd. and Rosecrans Ave.	6.4	5.0	6.7	5.2	7.0	5.3	7.0	5.2
Vista Del Mar and Imperial Hwy.	7.4	5.2	6.5	5.0	6.5	5.0	6.4	5.0

Concentrations in ppm	Horizon Year 2015							
	No Action/ No Project, ppm		Alternative A, ppm		Alternative B, ppm		Alternative C, ppm	
Intersection	**1-Hr**	**8-Hr**	**1-Hr**	**8-Hr**	**1-Hr**	**8-Hr**	**1-Hr**	**8-Hr**
Airport Blvd. and Century Blvd.	4.4	3.5	4.3	3.5	4.3	3.5	4.3	3.6
Aviation Blvd. and Century Blvd.	4.5	3.5	*4.4*	*3.6*	4.4	3.5	4.6	3.7
La Cienega Blvd. and Arbor Vitae St.	4.5	3.6	*4.6*	*3.5*	4.4	3.5	4.6	3.5
La Cienega Blvd. and Century Blvd.	4.4	3.6	*4.4*	*3.5*	4.4	3.5	4.5	3.5
La Cienega Blvd. and I-405 Ramps N/O Century Blvd.	4.4	3.5	*4.3*	*3.5*	4.3	3.5	4.2	3.5
La Cienega Blvd. and Florence Ave.	4.3	3.5	*4.3*	*3.5*	4.3	3.5	4.3	3.6
La Cienega Blvd. and Manchester Ave.	4.3	3.5	*4.5*	*3.5*	4.5	3.5	4.6	3.5
Lincoln Blvd. and Manchester Ave.	4.6	3.7	*4.7*	*3.6*	4.6	3.5	4.7	3.6
Lincoln Blvd. and 83rd St.	4.7	3.6	*4.3*	*3.5*	4.3	3.5	4.3	3.5
Lincoln Blvd. and La Tijera Blvd.	4.7	3.7	*4.5*	*3.7*	4.5	3.6	4.5	3.7
Sepulveda Blvd. and Imperial Hwy.	4.4	3.5	*4.6*	*3.6*	4.5	3.5	4.5	3.6
Sepulveda Blvd. and I-405 Ramps	4.2	3.5	*4.1*	*3.4*	4.1	3.3	4.2	3.4
Sepulveda Blvd. and Manchester Ave.	4.3	3.5	*4.2*	*3.4*	4.2	3.4	4.2	3.5
Sepulveda Blvd. and La Tijera Blvd.	4.3	3.5	*4.4*	*3.6*	4.5	3.6	4.4	3.6
Sepulveda Blvd. and Mariposa Ave.	4.3	3.4	*4.4*	*3.6*	4.4	3.5	4.5	3.6
Sepulveda Blvd. and Rosecrans Ave.	4.2	3.4	*4.7*	*3.7*	4.5	3.7	4.7	3.6
Vista Del Mar and Imperial Hwy.	5.1	3.6	*4.2*	*3.4*	4.2	3.4	4.2	3.4

[1] 1-hr CO CAAQS = 20 ppm; 1-hrCO NAAQS = 35 ppm

[2] 8-hr CO CAAQS = 9.0 ppm; 8-hr CO NAAQS = 9 ppm

Source: PCR Services Corp., 2000; PCR Services Corp., Technical Report: Off-Airport Air Quality Analysis, March 1998.

Table 34

Unmitigated Construction Air Pollutant Concentrations (Including Background)

Pollutant (Conc. units)	Averaging Period	Environmental Baseline	Horizon Year 2005 Alternative			
			NA/NP	A	B	C
CO (ppm)	Eight Hour	8.5	NM	6.4	6.0	5.9
	One Hour	10.6	NM	9.3	8.0	7.9
NO$_2$ (ppm)	Annual	0.0295	NM	0.06	0.07	0.06
	One Hour	0.15	NM	1.67	1.02	0.93
PM$_{10}$ (µg/m^3)^2	AAM	36	NM	62	72	68
	AGM	34	NM	58	68	64
	24 Hour	82	NM	301	211	197

Pollutant (Conc. units)	Averaging Period	Environmental Baseline	Horizon Year 2015 Alternative			
			NA/NP	A	B	C
CO (ppm)	Eight Hour	8.5	NM	3.4	3.7	3.7
	One Hour	10.6	NM	4.2	4.6	4.6
NO2 (ppm)	Annual	0.0295	NM	0.015	0.03	0.03
	One Hour	0.15	NM	0.09	0.19	0.18
PM10 (□g/m3)2	AAM	36	NM	25	88	82
	AGM	34	NM	21	84	78
	24 Hour	82	NM	47	228	210

Pollutant (Conc. units)	Averaging Period	Environmental Baseline	Year of Peak Construction Emissions[1] Alternative			
			NA/NP	A	B	C
CO (ppm)	Eight Hour	8.5	NM	5.5	5.6	5.5
	One Hour	10.6	NM	7.2	7.2	7.1
NO2 (ppm)	Annual	0.0295	NM	0.07	0.08	0.07
	One Hour	0.15	NM	0.60	0.55	0.51
PM10 (□g/m3)2	AAM	36	147	98	80	75
	AGM	34	143	94	76	71
	24 Hour	82	317	323	290	268

AAM = Annual Arithmetic Mean.
AGM = Annual Geometric Mean.
NA/NP = No Action/No Project.
NM = Not modeled.
ppm = parts per million (by volume).
µg/m^3 = micrograms per cubic meter

[1] The peak year of construction emissions is 2004 for Alternatives A, B, C, and the No Action/No Project Alternative.

[2] Assumes soil stabilization reduces uncontrolled emissions by 50 percent.

Source: PCR Services Corp., 2000; PCR Services Corp., Technical Memorandum: On- and Off-Site Construction Air Pollutant Dispersion, March 1998; PCR Services Corp., Technical Memorandum: Air Emissions Analysis of Construction Activities, March 1998.