Handbook for Project-level Analyses

California Environmental Protection Agency
Air Resources Board

Mobile Source Analysis Branch
Planning & Technical Support Division

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1. Introduction

The California Air Resources Board (CARB) maintains the EMission FACtors (EMFAC) model, which is approved by USEPA for developing on-road motor vehicle emission inventories and conformity analyses in California.[1] EMFAC models on-road mobile source emissions under multiple temporal and spatial scales; it produces composite emission factors for an average day of a month (January to December), a season (summer and winter), or an annual average, for specific California geographic areas by air basin, district, and county as well as the statewide level. EMFAC can produce $PM_{2.5}$ and PM_{10} emission rates for three exhaust emission processes (running, starting, and idle), tire wear, and brake wear.

In 2011, ARB released an updated version of the EMFAC model called EMFAC2011, which consists of three modules: EMFAC-LDV which estimates passenger vehicles emissions; EMFAC-HD which estimates emissions from diesel trucks and buses over 14,000 lbs.; and a third module called EMFAC-SG which integrates the output of EMFAC-LDV and EMFAC-HD and provides users with the ability to conduct scenario assessments for air quality and transportation planning. In addition, ARB also enhanced data availability by providing a new database through the ARB mobile source emissions inventory web site (EMFAC Web Database) that provides regional population, activity, emissions, and emission rates at varying levels of detail.

ARB has developed this handbook as a guide to use EMFAC2011 to conduct project-level analyses. This section of the handbook describes the steps to generate emission rates to estimate a project's exhaust, brake wear, and tire wear emissions for project-level analyses in California.

Please note that for PM10 or PM2.5 transportation conformity hot-spot analyses, users should also refer to Section 5 of EPA's Quantitative PM Hot-spot Guidance. EPA is currently developing EMFAC2011 guidance in coordination with ARB, and when finalized, it will be posted at EPA's conformity website at: www.epa.gov/otaq/stateresources/transconf/policy.htm#project.

1.1. What's New for Project-level Analysis?

Since EMFAC2011 uses a modular emissions modeling approach that departs from the single model approach used by EMFAC 2007, it may now be necessary to use more than one method – or go to more than one place to obtain the emission rates needed for conducting project-level analyses. In order to aid the user to obtain emission rates for project level assessments, ARB has released a new tool called EMFAC2011-PL. Projects using the default information can utilize the EMFAC2011-PL tool to obtain standard emission rates at the desired vehicle category scheme (which includes EMFAC2011, EMFAC2007, Truck/Non-Truck, and ALL Vehicles Combined level)[2]. Where changes are made to the

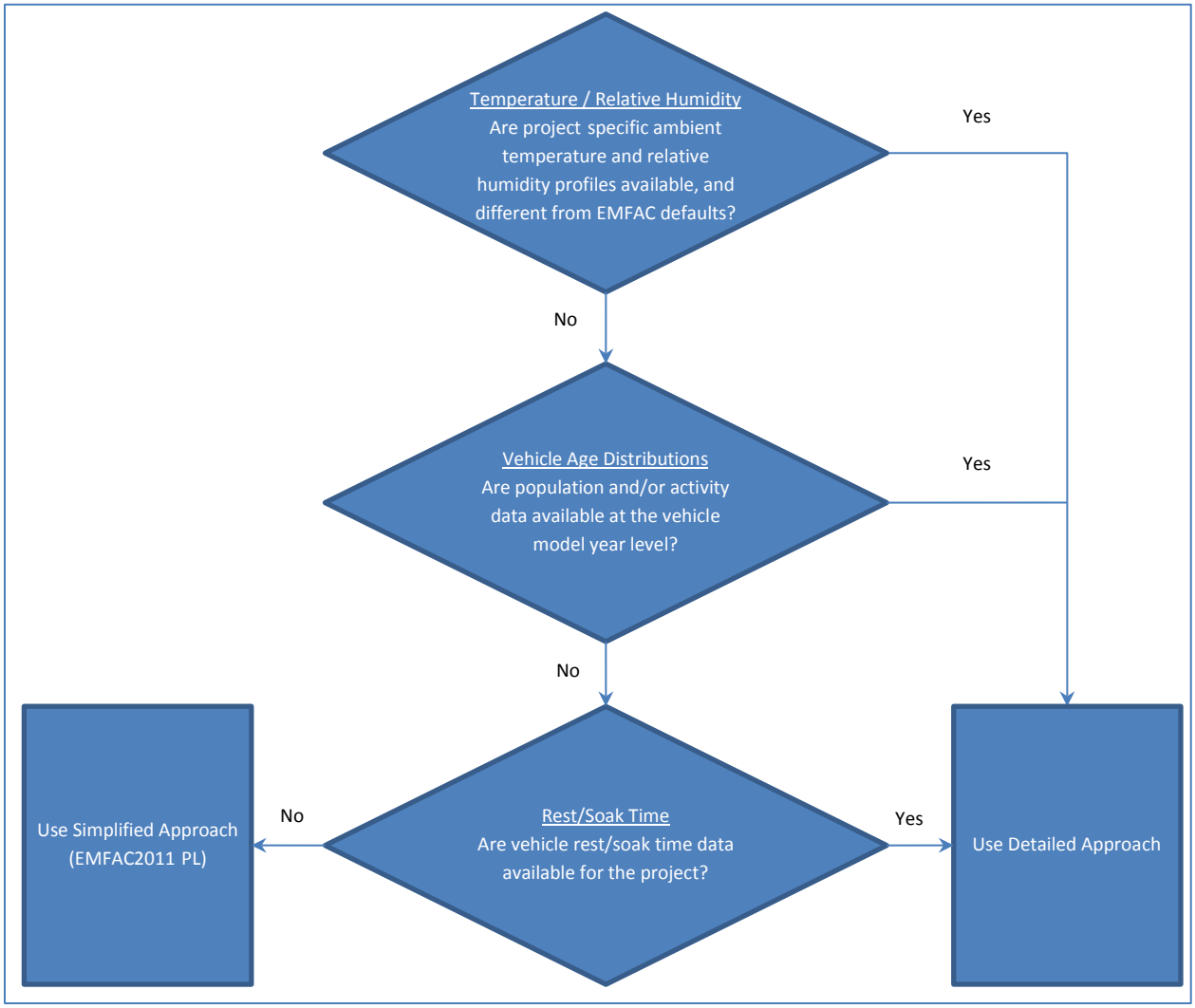
[1] The current version of the EMFAC model, future model versions, and supporting documentation can be downloaded from the CARB website at: www.arb.ca.gov/msei/onroad/latest_version.htm.
[2] More information on Vehicle Categories is available at http://www.arb.ca.gov/msei/vehicle-categories.xlsx

default assumptions, projects will need to use a combination of EMFAC2011-LDV, the online emission rates database (http://www.arb.ca.gov/emfac), or the online idling rates database (http://www.arb.ca.gov/msei/emfac2011_idling_emission_rates.xlsx).

2. Approach for Project Level Analysis

To complete an EMFAC-based project-level analysis, users need to determine the scope and resolution of traffic activity data, identify basic scenario data inputs, and gather project-specific traffic data and fleet data. Based on the availability of information, users can follow the General Decision Matrix explained in Figure 1 and select either (a) the Simplified Approach, or (b) the Detailed Approach. The simplified approach is appropriate when projects utilize EMFAC default parameters for the region for the following variables: (a) ambient temperature and relative humidity profiles, (b) vehicle age distributions, and (c) vehicle rest/soak time. If there is more appropriate project-specific information for any of the three variables, then the user is encouraged to use the detailed approach. The approach selection criteria and the two approaches are explained in further detail in the following sections.

Figure 1: General Decision Matrix for Project-level Assessment [3]



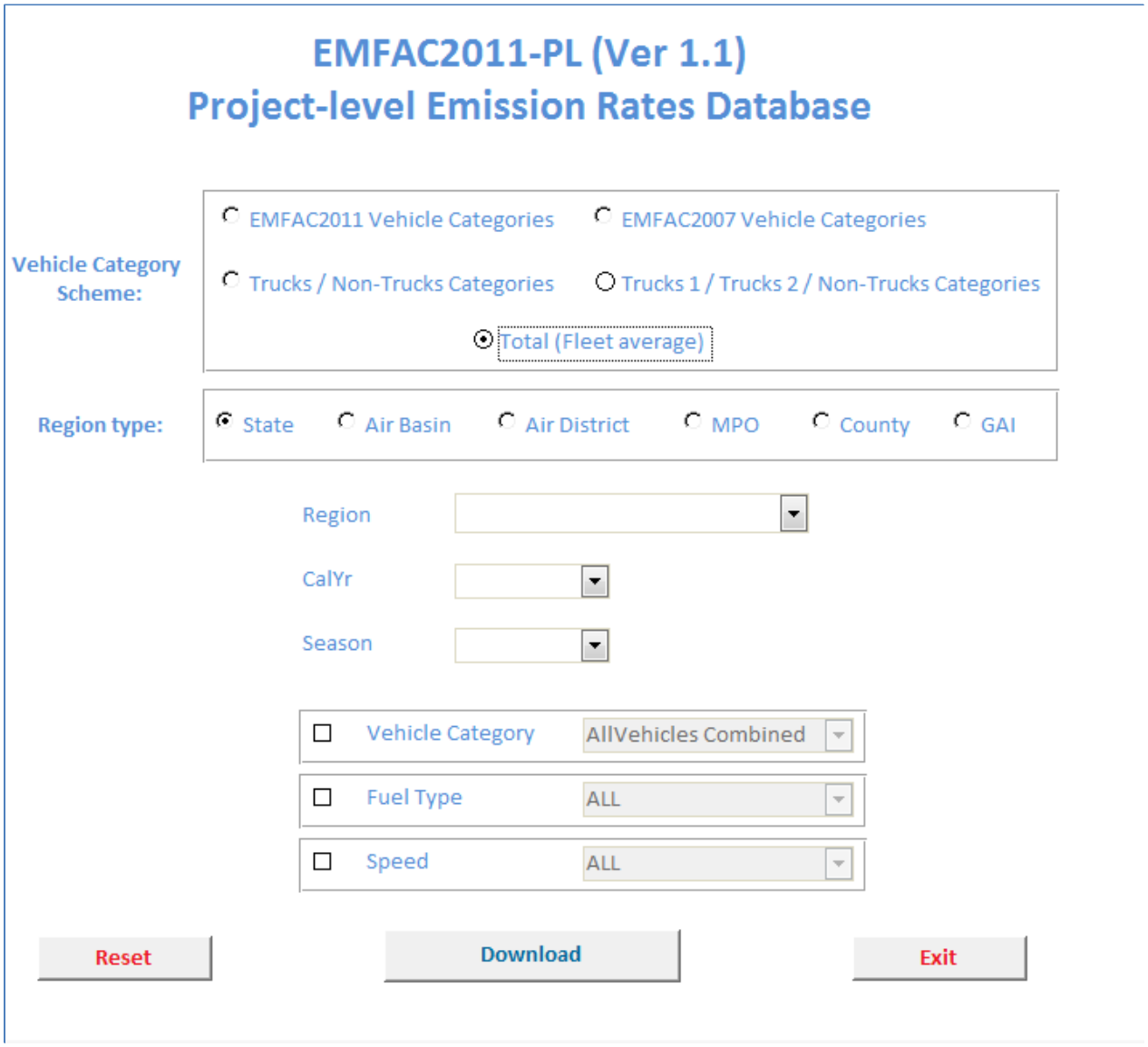
[3] Variation in ambient Temperature and Relative Humidity do not affect PM emissions. Therefore, for PM assessments, Step 1 can be ignored.

These approaches report process emission rates consistent with EMFAC2011. These emission factor output data should be paired with project-specific activity data to estimate project-level emissions. For example, to calculate project-level running exhaust PM emissions, users need to combine the average running exhaust PM emission factors (in g/mile) provided by EMFAC2011-PL with project-level activity data such as vehicle miles travelled (VMT) by speed bin.

3. Simplified Approach

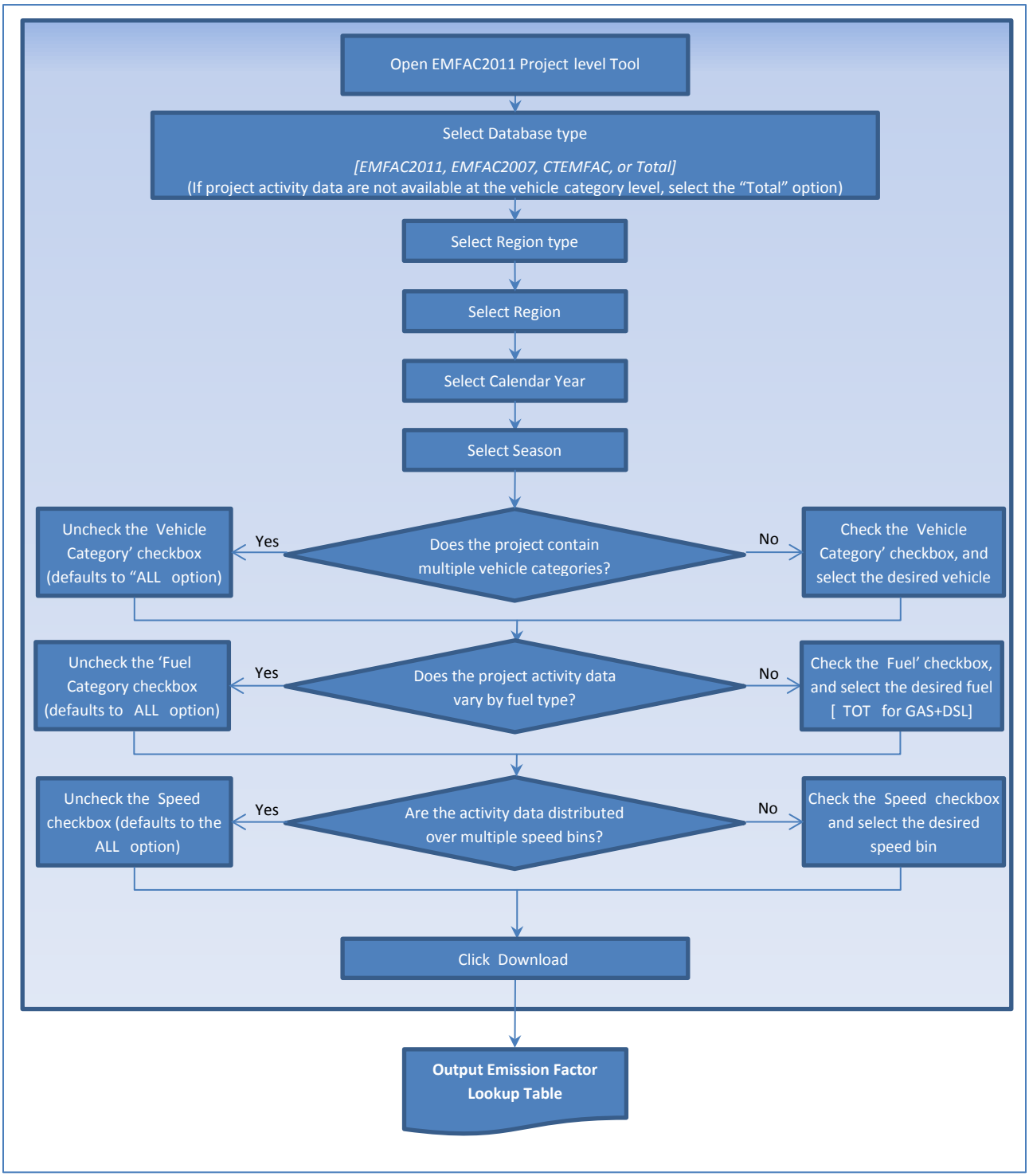
ARB has released a Project-level assessment tool (EMFAC2011-PL) to assist in the development of emission rates for the purposes of project-level assessments. The EMFAC2011-PL is a new simplified tool that generates emission rates for use in project-level assessments. EMFAC-PL uses emissions and activity data from EMFAC2011-SG module inventory files (default inventories of EMFAC-LDV and EMFAC-HD modules) and calculates emission factors consistent with the default fleet distributions in the region. The tool is available on ARB's Mobile Source Emission Inventory website (http://www.arb.ca.gov/msei/modeling.htm).

Figure 2: Graphical User Interface (GUI) of the EMFAC2011-PL Tool



The general methodology for using the Simplified Approach is explained in the figure below.

Figure 3: Simplified Approach for Project-level Assessment



The emission rates are available through the EMFAC2011-PL tool. Users are required to select the following options:

- Vehicle Category Scheme: EMFAC2011, EMFAC2007, Trucks/Non-Trucks, ALL Vehicles [2]
- Region Type: Statewide Average, Air Basin, Air District, MPO, County, Sub-Area (GAI)
- Region
- Calendar Year
- Season

Based on the Vehicle Category Scheme selection, users may also select specific vehicle type, or get emission factors for all corresponding vehicle categories. For example, if the user selects EMFAC2007 scheme, then they may select from the 13 vehicle categories specific to EMFAC2007 [2 above] (LDA, LDT1, LDT2, MDV, MCY, LHD1, LHD2, MHDT, HHDT, MH, OBUS, SBUS, and UBUS).

Users may also select options for fuel type (GAS, DSL, TOT, or ALL) and speed bin (14 speed bins between 5 -70 MPH at 5 MPH increments) to get emission rates corresponding to project-specific data.

The EMFAC2011-PL tool downloads the emission rates for the selected vehicles for all processes as described below:

- Running Exhaust Emissions Rates [RUNEX] in g/mile/veh
- Idling Exhaust Emissions Rates [IDLEX] in g/hr/veh
- Starting Exhaust Emissions Rates [STREX] in g/trip/veh
- PM Brake Wear [PMBW] and PM Tire Wear [PMTW] in g/mile/veh
- Evaporative Emission Rates in g/veh/day
    - Diurnal Emissions [DIURN]
    - Hot Soak Emissions [HTSK]
    - Running Loss Emissions [RUNLS]
    - Resting Loss Emissions [RESTL]

More information and detailed step-by-step instructions for a few *illustrative* example projects using the Simplified Approach are available in Appendix A (Pages 6 through 38).

4. Detailed Approach

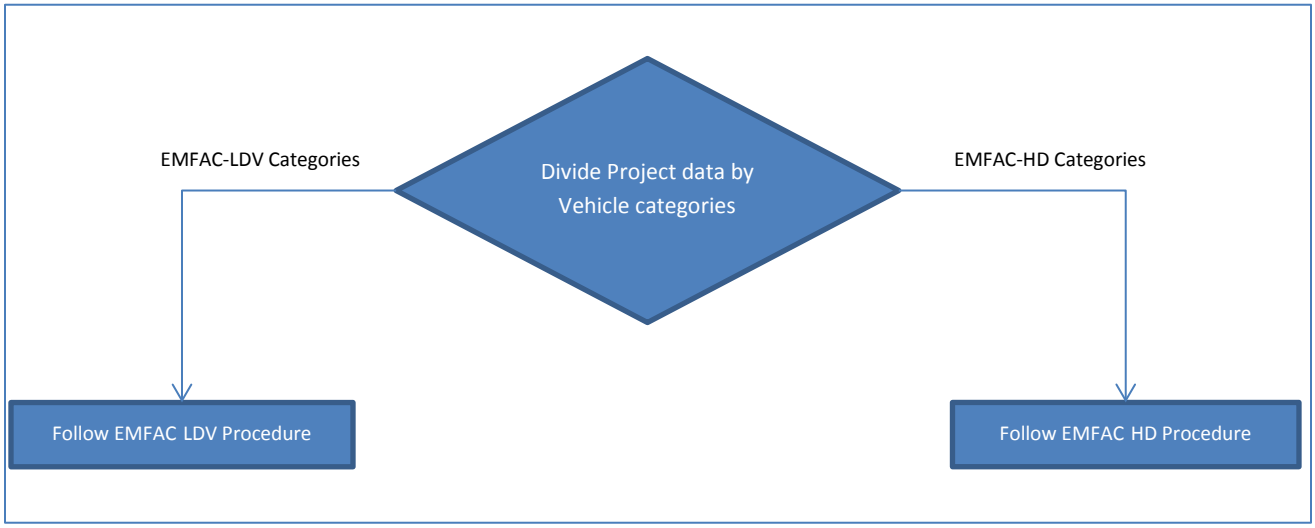
The detailed approach is to be followed when either (a) regional temperature and/or relative humidity profiles differ from EMFAC default, (b) the vehicle age distributions different from EMFAC defaults, or (c) vehicle rest/soak time data are available for the project.

The detailed approach consists of two parts:

- EMFAC-LDV Procedure
- EMFAC-HD Procedure

Depending on the fleet mix for the project, users may need to use either the EMFAC-LDV procedure, or the EMFAC-HD Procedure, or both the procedures together.

Figure 4: Detailed Approach for Project-level Assessment



Note: When modeling bus fleets, users must select the appropriate type from the several kinds of buses available in EMFAC2011:

- Urban buses in California are primarily natural gas buses certified to diesel standards (there are still some diesels around that are certified to diesel standards). So if the project is looking at publicly owned urban transit buses, then the Urban Bus category would be appropriate. [EMFAC-LDV]
- If the terminal is private and the focus is on something like Greyhound buses, then the appropriate category is Motor Coach. Motor Coaches are heavy buses with a specific body type used for interregional transit. They are regulated through the Truck and Bus rule. [EMFAC-HD]
- Rental car shuttles are covered under the Other Bus (Diesel) category. [EMFAC-HD]
- EMFAC also models Other Bus (Gasoline) category vehicles. Other buses are regulated under the Truck and Bus Rule. [EMFAC-LDV]

4.1. Detailed Approach – EMFAC-LDV Procedure

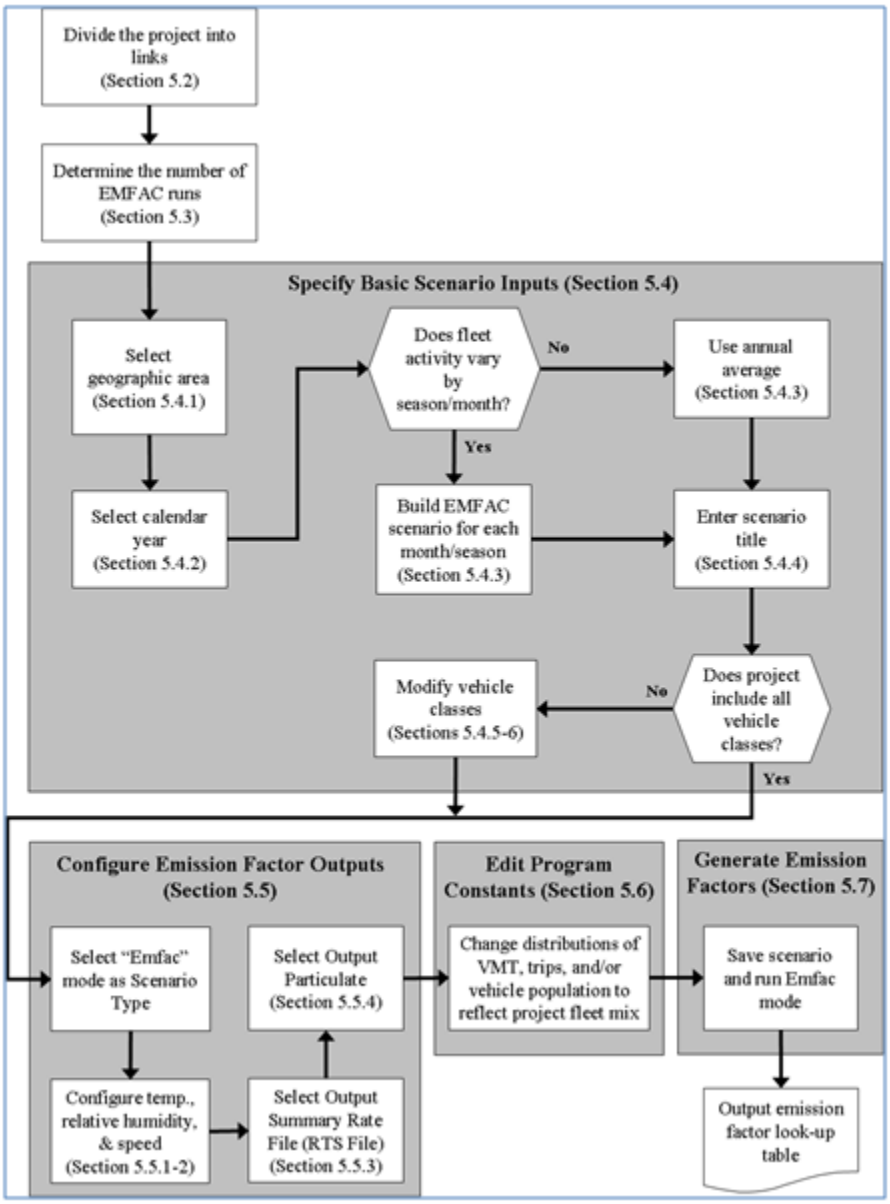
The Detailed Approach – EMFAC-LDV Procedure should be used when generating emission rates for any of the LDV vehicle categories listed in Table 1.

Table 1: EMFAC2011-LDV Vehicle Categories

EMFAC2011 Vehicle & Technology	Description
LDA – DSL	Passenger Cars
LDA – GAS	Passenger Cars
LDT1 – DSL	Light-Duty Trucks (0-3750 lbs)
LDT1 – GAS	Light-Duty Trucks (0-3750 lbs)
LDT2- DSL	Light-Duty Trucks (3751-5750 lbs)
LDT2 – GAS	Light-Duty Trucks (3751-5750 lbs)
LHD1 – DSL	Light-Heavy-Duty Trucks (8501-10000 lbs)
LHD1 – GAS	Light-Heavy-Duty Trucks (8501-10000 lbs)
LHD2 – DSL	Light-Heavy-Duty Trucks (10001-14000 lbs)
LHD2 – GAS	Light-Heavy-Duty Trucks (10001-14000 lbs)
MCY – GAS	Motorcycles
MDV – DSL	Medium-Duty Trucks (5751-8500 lbs)
MDV – GAS	Medium-Duty Trucks (5751-8500 lbs)
MH – DSL	Motor Homes
MH – GAS	Motor Homes
T6TS – GAS	Medium-Heavy Duty Gasoline Truck
T7IS – GAS	Heavy-Heavy Duty Gasoline Truck
SBUS – GAS	School Buses
UBUS – DSL	Urban Buses
UBUS – GAS	Urban Buses
OBUS – GAS	Other Buses

The current version of the EMFAC model, future model versions, and supporting documentation can be downloaded from the CARB website at: www.arb.ca.gov/msei/onroad/latest_version.htm. The steps to using EMFAC2011-LDV are illustrated in the figure on the following page. Additional details will be available in the EPA's guidance, when finalized (www.epa.gov/otaq/stateresources/transconf/policy.htm#project).

Figure 5: Process for Generating Emission Rates for EMFAC-LDV Vehicles (Detailed Approach)



More information and detailed step-by-step instructions for a few *illustrative* example projects using the Detailed Approach for EMFAC-LDV vehicles are available in Appendix A (Page 38 and Page 64).

4.2. Detailed Approach – EMFAC-HD Procedure

The Detailed Approach – EMFAC-HD Procedure should be used when generating emission rates for any of the EMFAC2011-HD vehicle categories listed in Table 2.

Table 2: EMFAC2011-HD Vehicle Categories

EMFAC2011 Vehicle & Technology	Description
T6 Ag - DSL	Medium-Heavy Duty Diesel Agriculture Truck
T6 CAIRP heavy - DSL	Medium-Heavy Duty Diesel CA International Registration Plan Truck with GVWR>26000 lbs
T6 CAIRP small - DSL	Medium-Heavy Duty Diesel CA International Registration Plan Truck with GVWR<=26000 lbs
T6 instate construction heavy - DSL	Medium-Heavy Duty Diesel instate construction Truck with GVWR>26000 lbs
T6 instate construction small - DSL	Medium-Heavy Duty Diesel instate construction Truck with GVWR<=26000 lbs
T6 instate heavy - DSL	Medium-Heavy Duty Diesel instate Truck with GVWR>26000 lbs
T6 instate small - DSL	Medium-Heavy Duty Diesel instate Truck with GVWR<=26000 lbs
T6 OOS heavy - DSL	Medium-Heavy Duty Diesel Out-of-state Truck with GVWR>26000 lbs
T6 OOS small - DSL	Medium-Heavy Duty Diesel Out-of-state Truck with GVWR<=26000 lbs
T6 Public - DSL	Medium-Heavy Duty Diesel Public Fleet Truck
T6 utility - DSL	Medium-Heavy Duty Diesel Utility Fleet Truck
T7 Ag - DSL	Heavy-Heavy Duty Diesel Agriculture Truck
T7 CAIRP - DSL	Heavy-Heavy Duty Diesel CA International Registration Plan Truck
T7 CAIRP construction - DSL	Heavy-Heavy Duty Diesel CA International Registration Plan Construction Truck
T7 NNOOS - DSL	Heavy-Heavy Duty Diesel Non-Neighboring Out-of-state Truck
T7 NOOS - DSL	Heavy-Heavy Duty Diesel Neighboring Out-of-state Truck
T7 other port - DSL	Heavy-Heavy Duty Diesel Drayage Truck at Other Facilities
T7 POAK - DSL	Heavy-Heavy Duty Diesel Drayage Truck in Bay Area
T7 POLA - DSL	Heavy-Heavy Duty Diesel Drayage Truck near South Coast
T7 Public - DSL	Heavy-Heavy Duty Diesel Public Fleet Truck
T7 Single - DSL	Heavy-Heavy Duty Diesel Single Unit Truck
T7 single construction - DSL	Heavy-Heavy Duty Diesel Single Unit Construction Truck
T7 SWCV - DSL	Heavy-Heavy Duty Diesel Solid Waste Collection Truck
T7 tractor - DSL	Heavy-Heavy Duty Diesel Tractor Truck
T7 tractor construction - DSL	Heavy-Heavy Duty Diesel Tractor Construction Truck
T7 utility - DSL	Heavy-Heavy Duty Diesel Utility Fleet Truck
PTO - DSL	Power Take Off
SBUS - DSL	School Buses
Motor Coach - DSL	Motor Coach
All Other Buses - DSL	All Other Buses

In order to capture all the emission processes for EMFAC-HD vehicle categories, users will need to access multiple data sources (described in Table 3 below). This is because the data formats and input requirements are quite different for different processes:

- Running Exhaust Emission Rates (g/mile) change by speed, and therefore, requires speed as an input.
- PM Brake Wear and Tire Wear Emissions Rates (g/mile) are assumed to be same at all speeds (EMFAC outputs it at the "ALL Combined Speed" level).
- Idling Exhaust Emission Rates (g/hour) are based on idling time.

All the required emission rates are available on the ARB website. The specific tools used to generate emission rates for the HD vehicle categories will vary depending on the particular type of emissions selected. Table 3 provides a quick reference for data sources for each of the emission processes. Users need to follow all the procedures detailed in following sections (4.2.1-4.2.3) to estimate emission from EMFAC-HD vehicles.

Table 3: Data Sources for EMFAC-HD Vehicle Emission Rates (Detailed Approach)

Emission Process	Where to Find	Units
Running Exhaust Emission Rates (RUNEX)	http://www.arb.ca.gov/emfac Download "by speed" for RUNEX	g/mile
Other Emission Rates[4] [PM Brake Wear and Tire Wear (PMBW/TW)]	http://www.arb.ca.gov/emfac Download "Combined" Speeds for Other	g/mile
Idling Exhaust Emission Rates (IDLEX)	http://www.arb.ca.gov/msei/emfac2011_idling_emission_rates.xlsx	g/hr

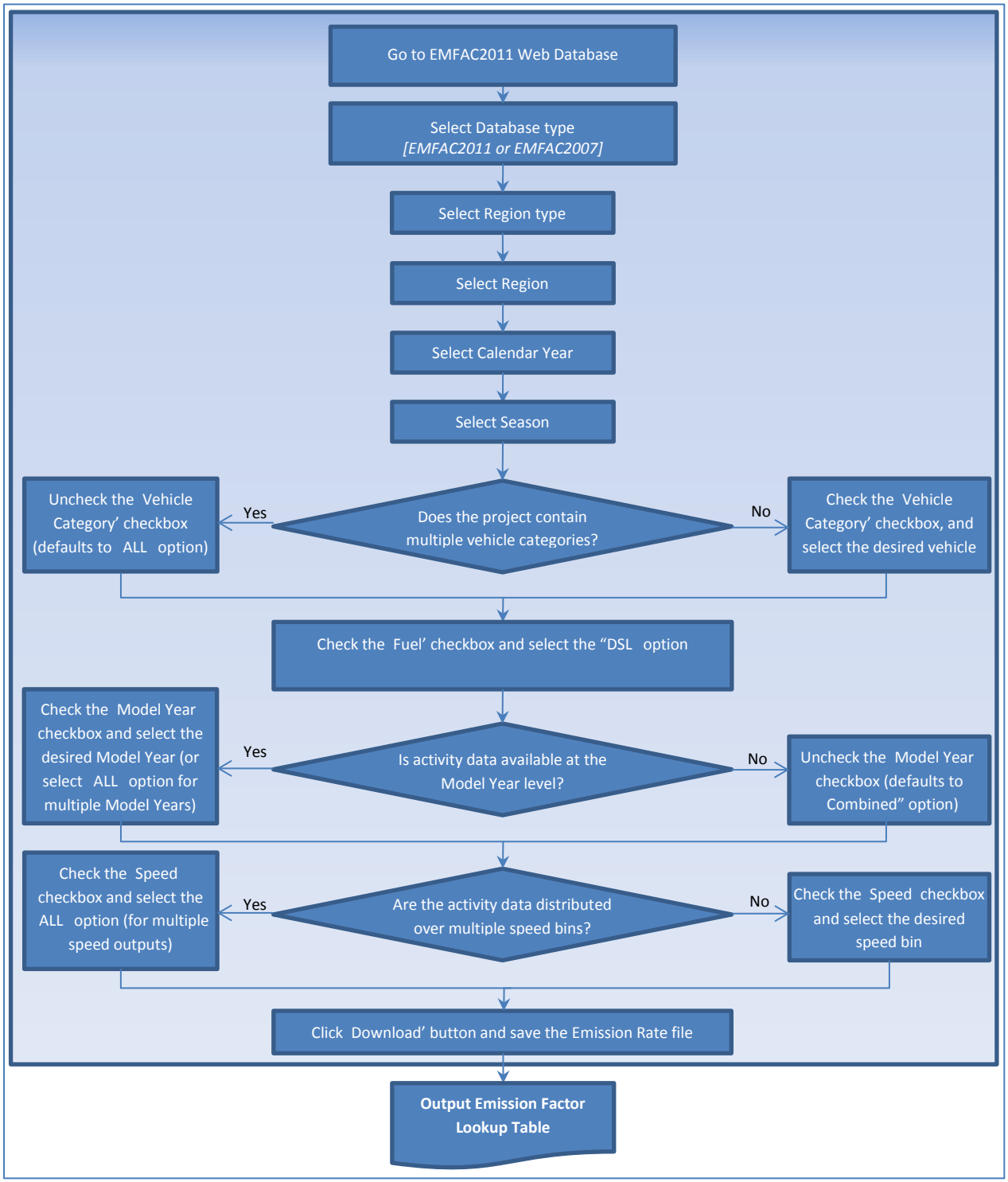
More information and detailed step-by-step instructions for a few *illustrative* example projects using the Detailed Approach for EMFAC-HD vehicles are available in Appendix A (Page 57 and Page 77).

[4] Since all EMFAC-HD vehicles use diesel fuel, EMFAC doesn't output separate Starting and Evaporative emissions

4.2.1. EMFAC-HD Vehicles: Running Exhaust Emission Rates (RUNEX)

The general methodology for generating Running Exhaust Emission Rates for EMFAC-HD Vehicles using the Detailed Approach is explained in Figure 6.

Figure 6: Process for Generating RUNEX Emission Rates for EMFAC-HD Vehicles (Detailed Approach)

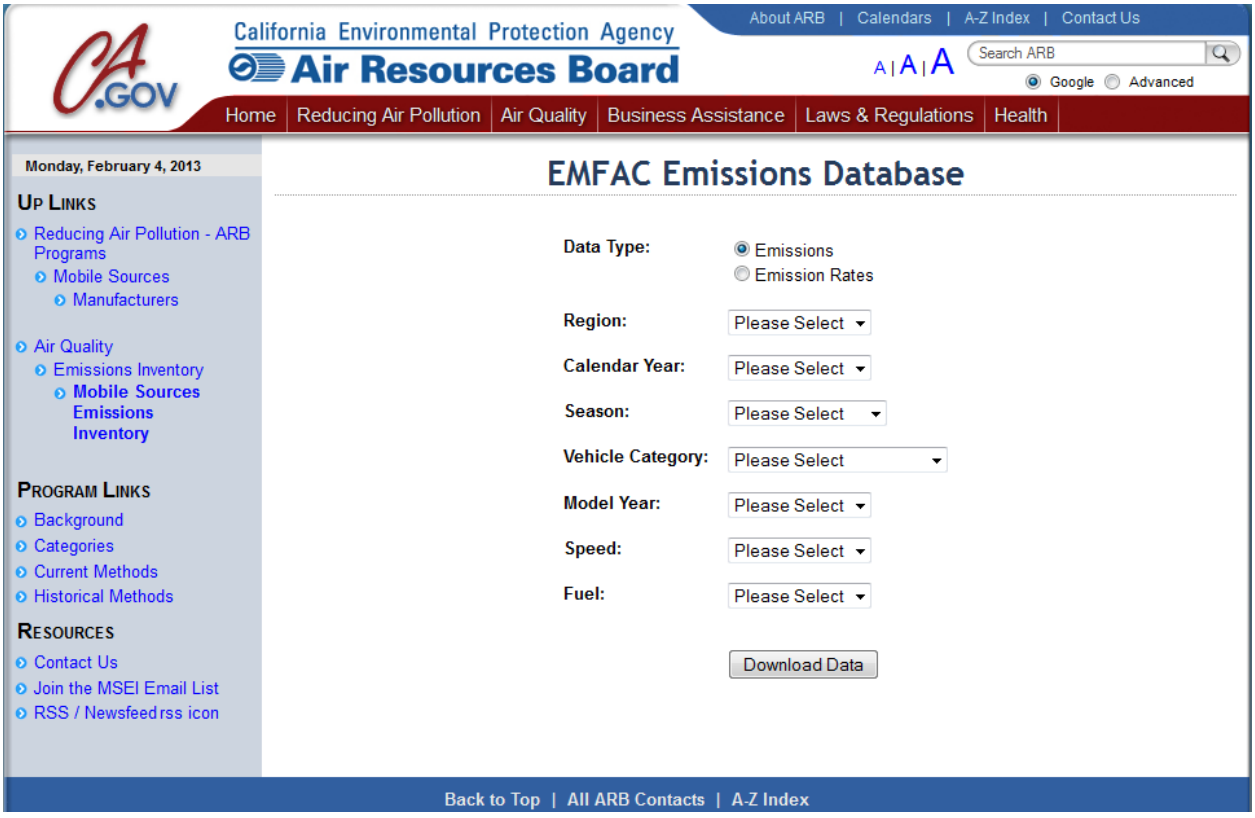


The emission rates are available through the EMFAC2011 web database (http://www.arb.ca.gov/emfac). Users are required to select the following options:

- Vehicle Category Scheme: EMFAC2011, EMFAC2007
- Region Type: Statewide Average, Air Basin, Air District, MPO, County, Sub-Area (GAI)
- Region
- Calendar Year
- Season
- Vehicle Type (based on vehicle category scheme selection)
- Fuel Type
- Model Year
- Speed

A screenshot of the EMFAC Web Database for Emission Rates is shown in Figure 7.

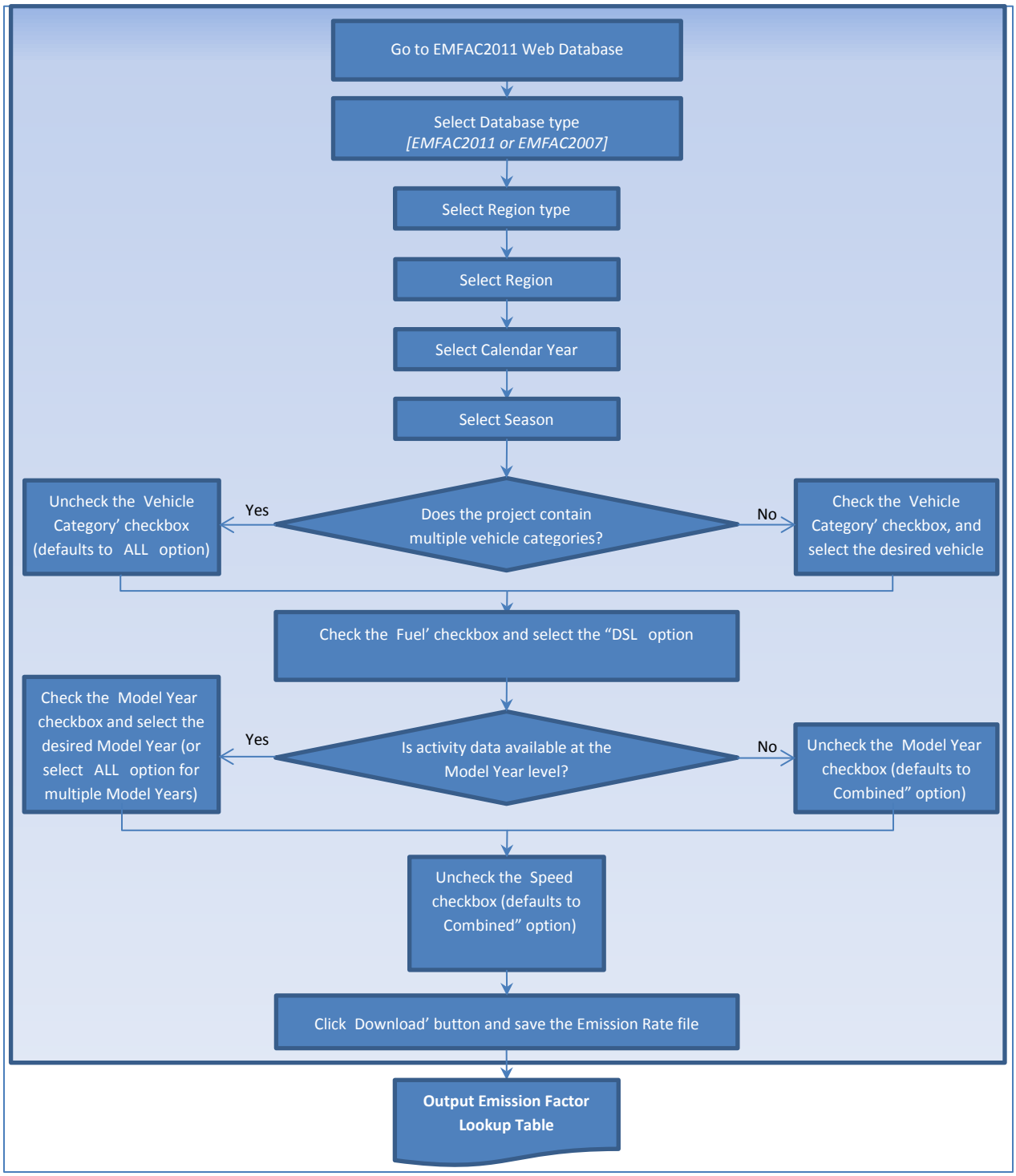
Figure 7: Graphical User Interface (GUI) of the EMFAC Web Database (Emission Rates)



4.2.2. EMFAC-HD Vehicles: Other Emission Rates (PMBW, PMTW) [4]

The general methodology for generating Other Emission Rates (PM Brake Wear and PM Tire Wear) for EMFAC-HD Vehicles using the Detailed Approach is explained in Figure 8.

Figure 8: Process for Generating Other Emission Rates for EMFAC-HD Vehicles (Detailed Approach)



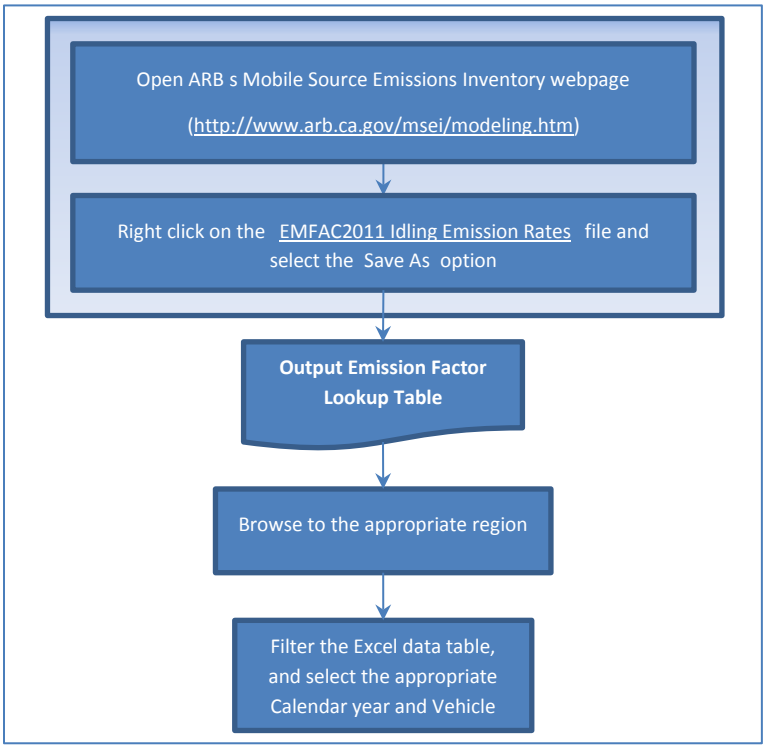
The emission rates are available through the EMFAC2011 web database (http://www.arb.ca.gov/emfac). Users are required to select the following options:

- Vehicle Category Scheme: EMFAC2011, EMFAC2007
- Region Type: Statewide Average, Air Basin, Air District, MPO, County, Sub-Area (GAI)
- Region
- Calendar Year
- Season
- Vehicle Type (based on vehicle category scheme selection)
- Fuel Type
- Model Year
- Speed (select "Combined" Speeds option)

4.2.3. EMFAC-HD Vehicles: Idling Exhaust Emission Rates (IDLEX)

The general methodology for generating Idling Exhaust Emission Rates for EMFAC-HD Vehicles using the Detailed Approach is explained in Figure 9.

Figure 9: Process for Generating IDLEX Emission Rates for EMFAC-HD Vehicles (Detailed Approach)



The emission rates are available in an Excel spreadsheet that can be downloaded from the web at http://www.arb.ca.gov/msei/emfac2011_idling_emission_rates.xlsx .

- The spreadsheet provides idling emission rates for EMFAC2011-HD vehicle categories (Diesel Vehicles classes for T6/MHDT, T7/HHDT, OBUS, and SBUS).
- Emission rates are in grams/hour
- Annual idling emission rates are a composite of winter and summer high idle.
- Emission rates are corrected for cleaner fuel, but not for retrofit requirements of the idling rule.
- HD Idling emission rates are available for two geographic areas: (1) the South Coast Air Basin and the South Central Coast (Ventura County) Air Basin; and (2) all other areas.

Specific idling emission rates can be selected by selecting select the “Filter” function from the “Data” menu and then selecting the following from the drop-down menus:

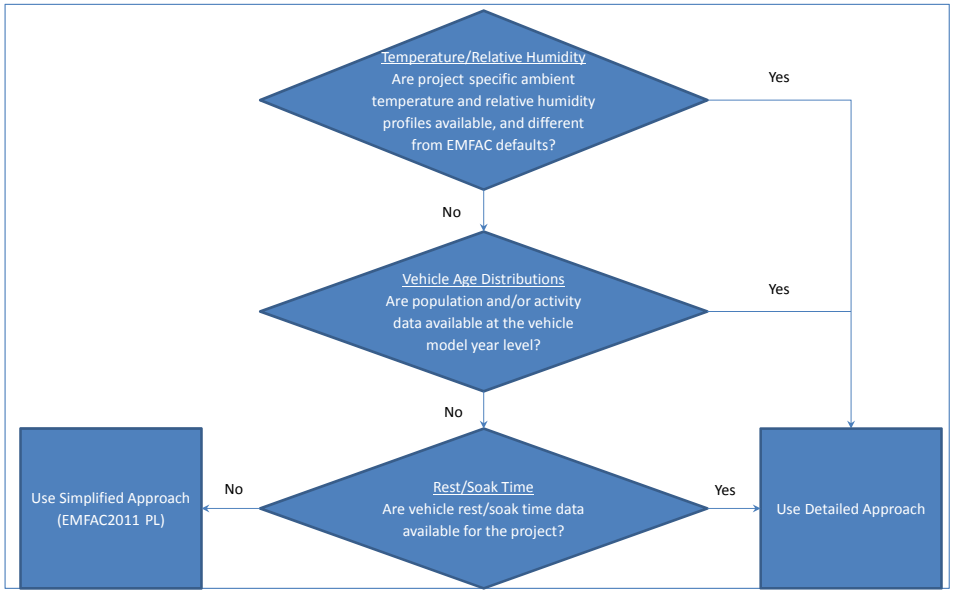
- By Calendar Year
- By Season
- By Vehicle Class
- By Fuel Type
- By Model Year

Appendix A

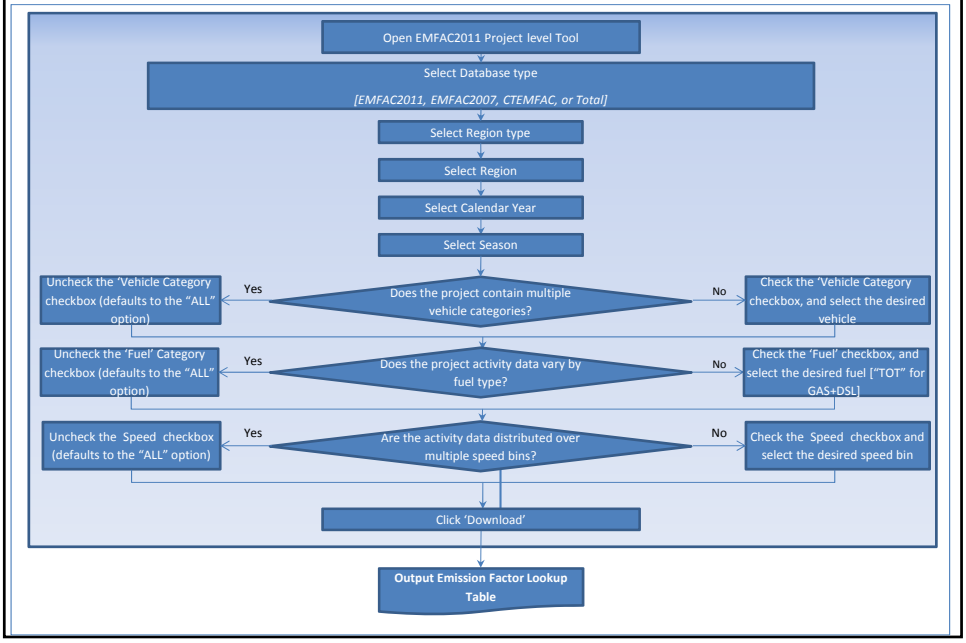
Project-level Analyses

Sample Scenarios

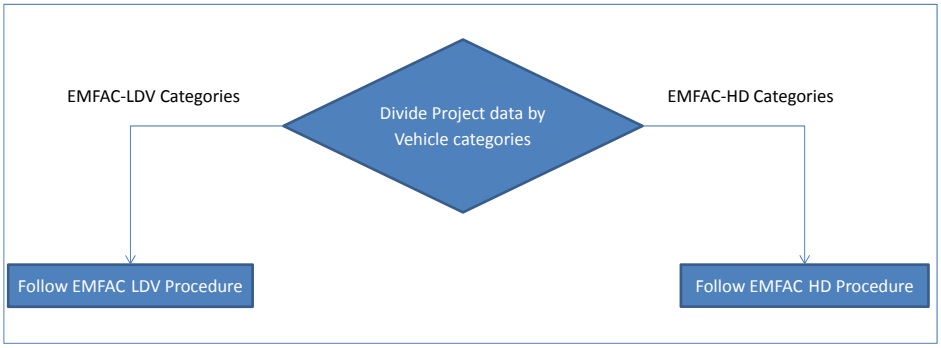
Decision Matrix



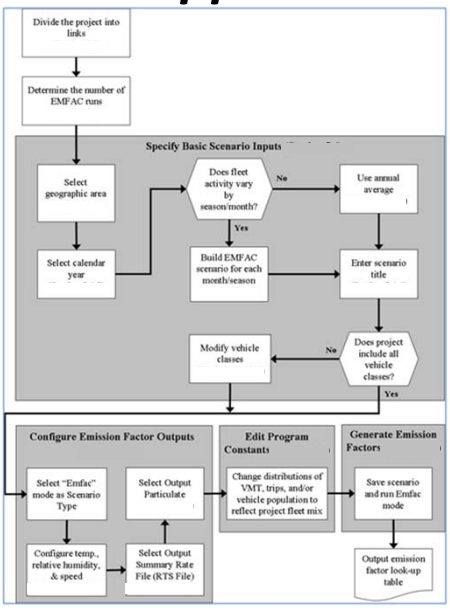
Simplified Approach



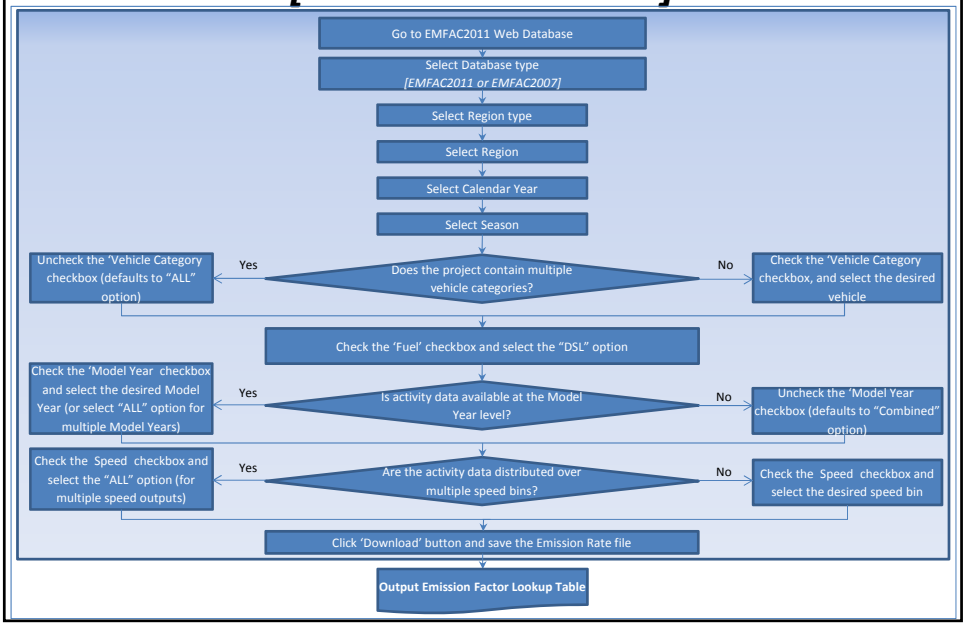
Detailed Approach



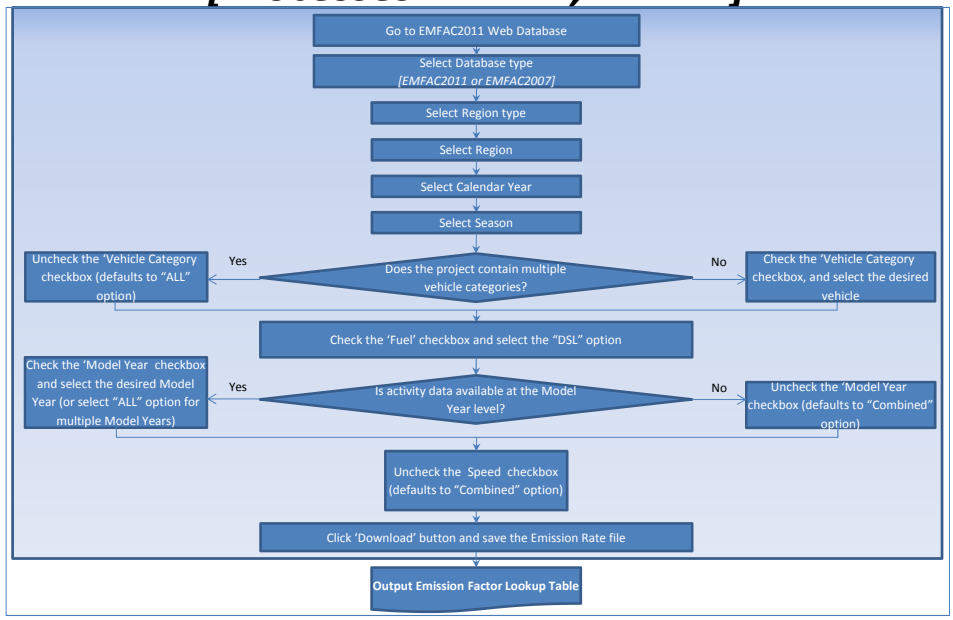
Detailed Approach - LDV



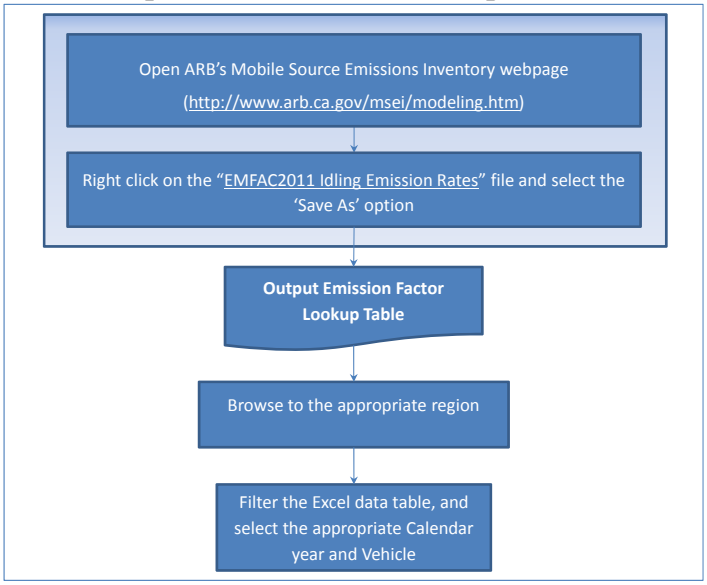
Detailed Approach – HD [Processes: RUNEX]



Detailed Approach – HD [Processes: PMBW, PMTW]



Detailed Approach – HD [Processes: IDLEX]



SAMPLE SCENARIOS

Project Details

- The project is a lane expansion of the existing highway and the addition of an interchange (on/off ramps) to access two park-and-ride lots and bus terminals
- Location: Sacramento, CA*
- The project is expected to be completed in 2019
  - Year of expected peak emissions (analysis year): 2020
- Area is in nonattainment of the annual PM2.5 NAAQS and the 2006 24-hour PM2.5 NAAQS
- Default EMFAC age distribution used
- Default EMFAC Sacramento county fleet mix used for arterials
  - Project-specific fleet mix available for highway LD vs. HD split
- Detailed bus roster (bus type and age distribution) provided by transit agency

*An additional sample scenario for LA County is also shown

Scenarios

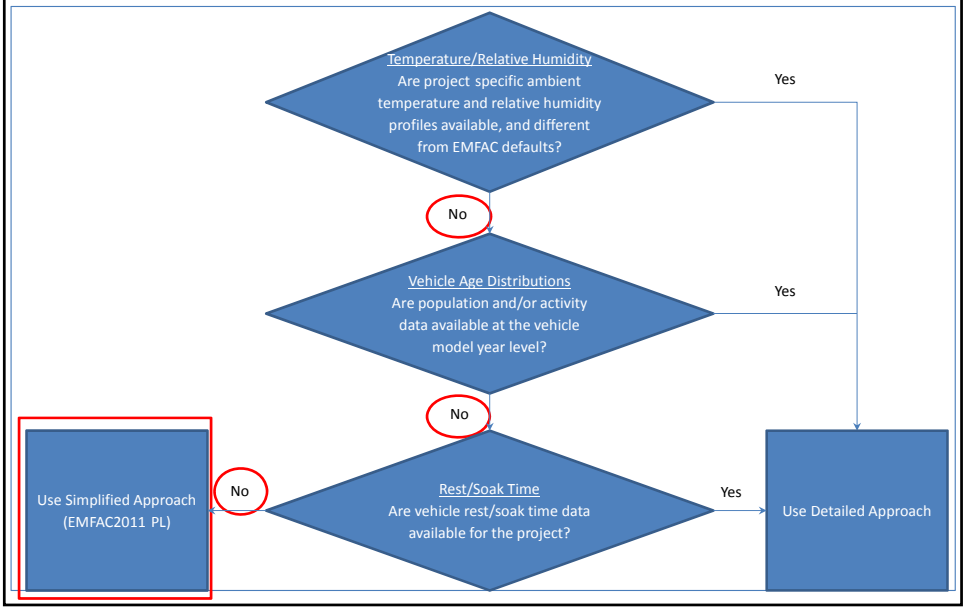
- Seven sample scenarios to cover a variety of project combinations are shown (based on variations in fleet mix):
  - One scenario for an arterial link - default fleet mix
  - One scenario for a freeway link - non-truck vehicles
  - One scenario for transit bus-only running links
  - One scenario for highway link with project-specific fleet mix
  - One scenario for bus-only transit terminal - Idle
  - One scenario for starts (light duty passenger cars and trucks only – default EMFAC mix)
  - One sample scenario where the fleet consists of light duty passenger cars (from EMFAC-LDV) and heavy duty trucks (from EMFAC-HD)

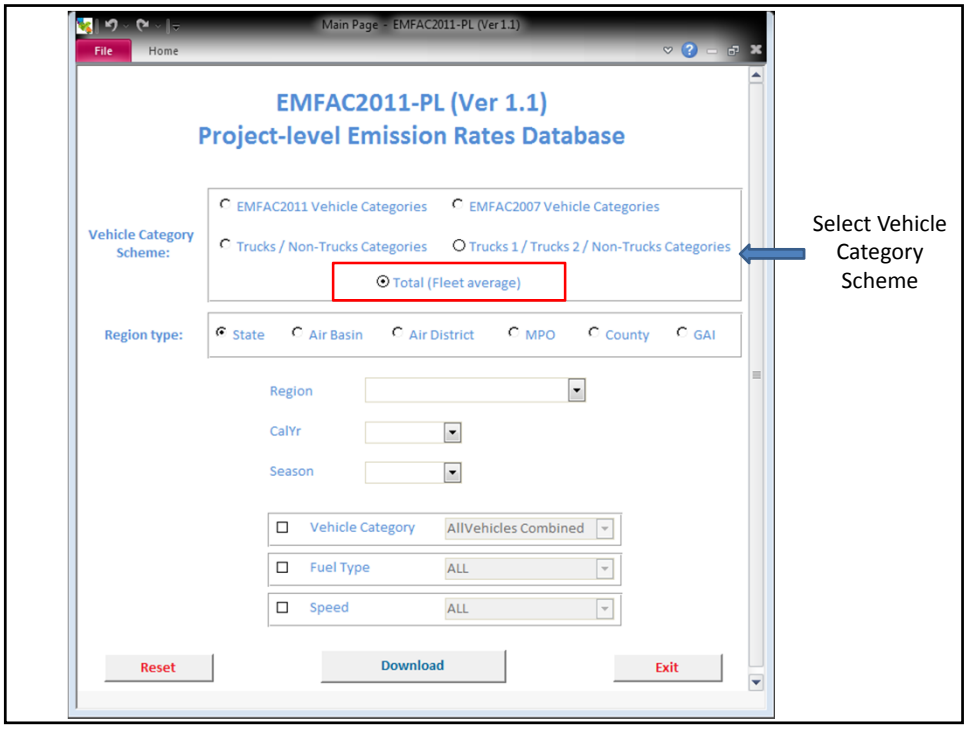
SCENARIO #1: Arterial link Default Fleet

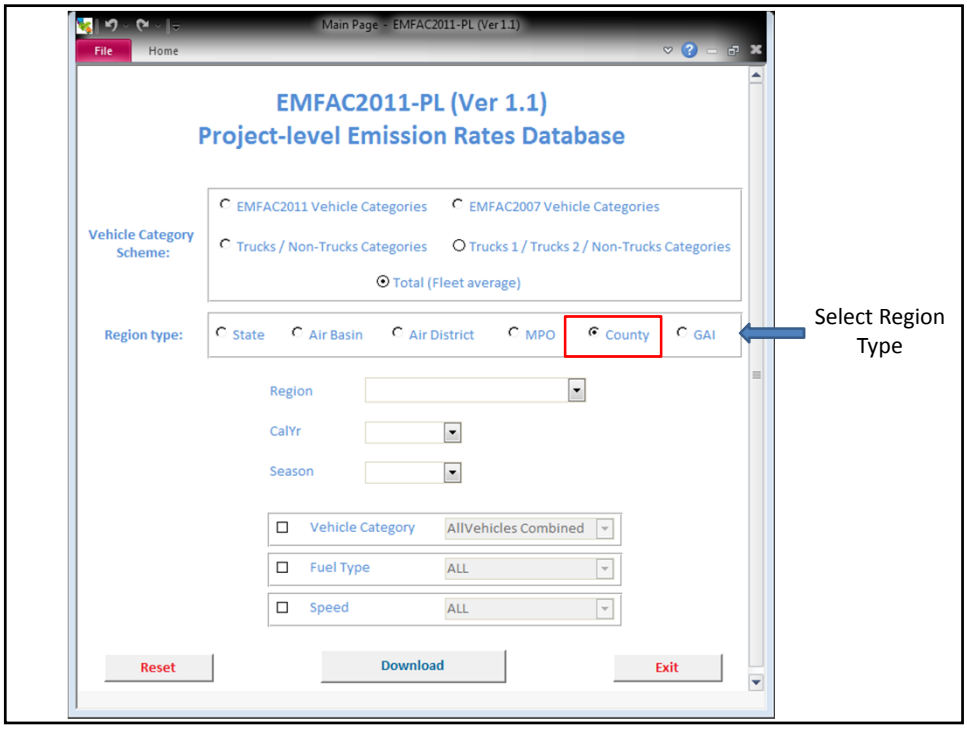
- One scenario for an arterial link with default fleet mix (vehicle and fuel/technology distributions are default)

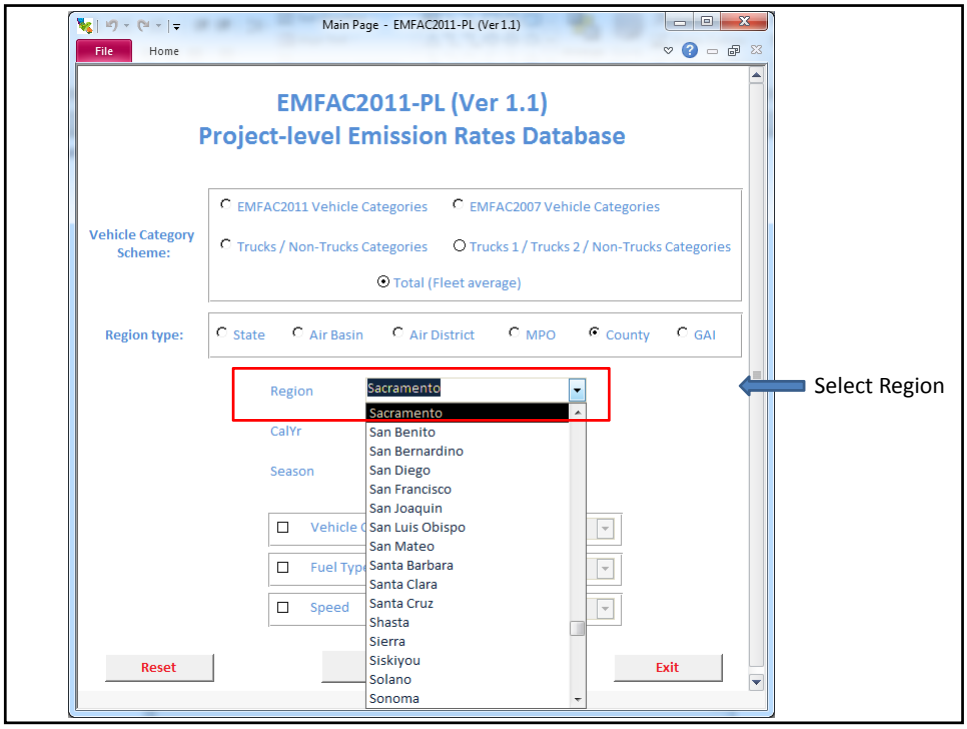
- Provide the emission rates for the project's arterials.
- Vehicles: All vehicle categories combined
- Fuel: All fuels with default technology distribution
- Speed: 30 MPH

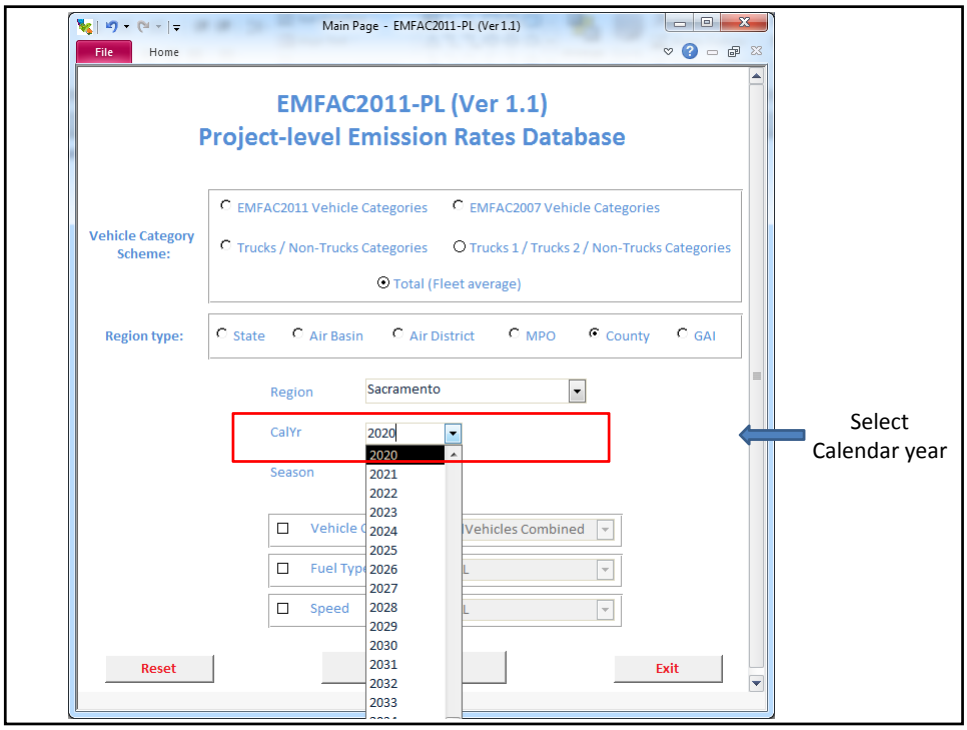
Protocol




Main Page - EMFAC2011-PL (Ver1.1)
File
Home
EMFAC2011-PL (Ver 1.1)
Project-level Emission Rates Database
Vehicle Category Scheme:
EMFAC2011 Vehicle Categories
EMFAC2007 Vehicle Categories
Trucks / Non-Trucks Categories
Trucks 1 / Trucks 2 / Non-Trucks Categories
Total (Fleet average)
Region type:
State
Air Basin
Air District
MPO
County
GAI
Region
CalYr
Season
Vehicle Category
AllVehicles Combined
Fuel Type
ALL
Speed
ALL
Reset
Download
Exit
Select Vehicle Category Scheme


Main Page - EMFAC2011-PL (Ver1.1)
File
Home
EMFAC2011-PL (Ver 1.1)
Project-level Emission Rates Database
Vehicle Category Scheme:
EMFAC2011 Vehicle Categories
EMFAC2007 Vehicle Categories
Trucks / Non-Trucks Categories
Trucks 1 / Trucks 2 / Non-Trucks Categories
Total (Fleet average)
Region type:
State
Air Basin
Air District
MPO
County
GAI
Region
CalYr
Season
Vehicle Category
AllVehicles Combined
Fuel Type
ALL
Speed
ALL
Reset
Download
Exit
Select Region Type


Main Page - EMFAC2011-PL (Ver1.1)
File
Home
EMFAC2011-PL (Ver 1.1)
Project-level Emission Rates Database
Vehicle Category Scheme:
EMFAC2011 Vehicle Categories
EMFAC2007 Vehicle Categories
Trucks / Non-Trucks Categories
Trucks 1 / Trucks 2 / Non-Trucks Categories
Total (Fleet average)
Region type:
State
Air Basin
Air District
MPO
County
GAI
Region
Sacramento
CalYr
Season
Vehicle
Fuel Type
Speed
Reset
Exit
Sacramento
San Benito
San Bernardino
San Diego
San Francisco
San Joaquin
San Luis Obispo
San Mateo
Santa Barbara
Santa Clara
Santa Cruz
Shasta
Sierra
Siskiyou
Solano
Sonoma
Select Region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Total (Fleet average)
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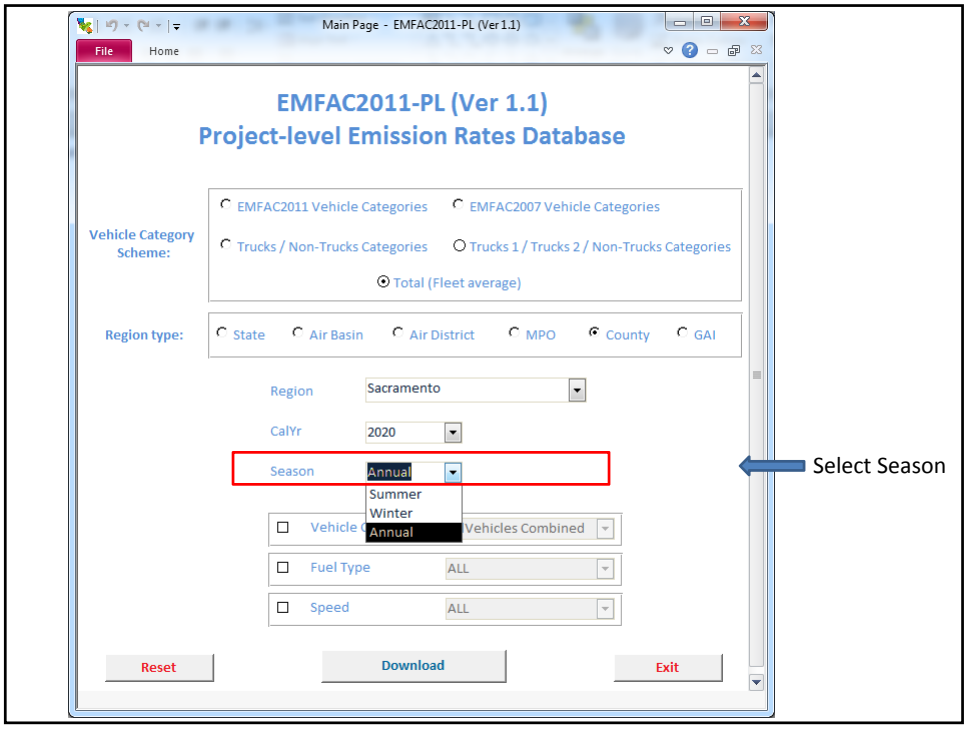
State
Air Basin
Air District
MPO
County
GAI
Region
Sacramento
CalYr
2020
Season
Vehicle
Vehicles Combined
Fuel Type
Speed
Reset
Exit
2020
2021
2022
2023
2024
2025
2026
2027
2028
2029
2030
2031
2032
2033
Select Calendar year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EMFAC2011-PL (Ver 1.1)
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Total (Fleet average)
Region type:
State
Air Basin
Air District
MPO
County
GAI
Region
Sacramento
CalYr
2020
Season
Annual
Summer
Winter
Annual
Vehicles Combined
Fuel Type
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Speed
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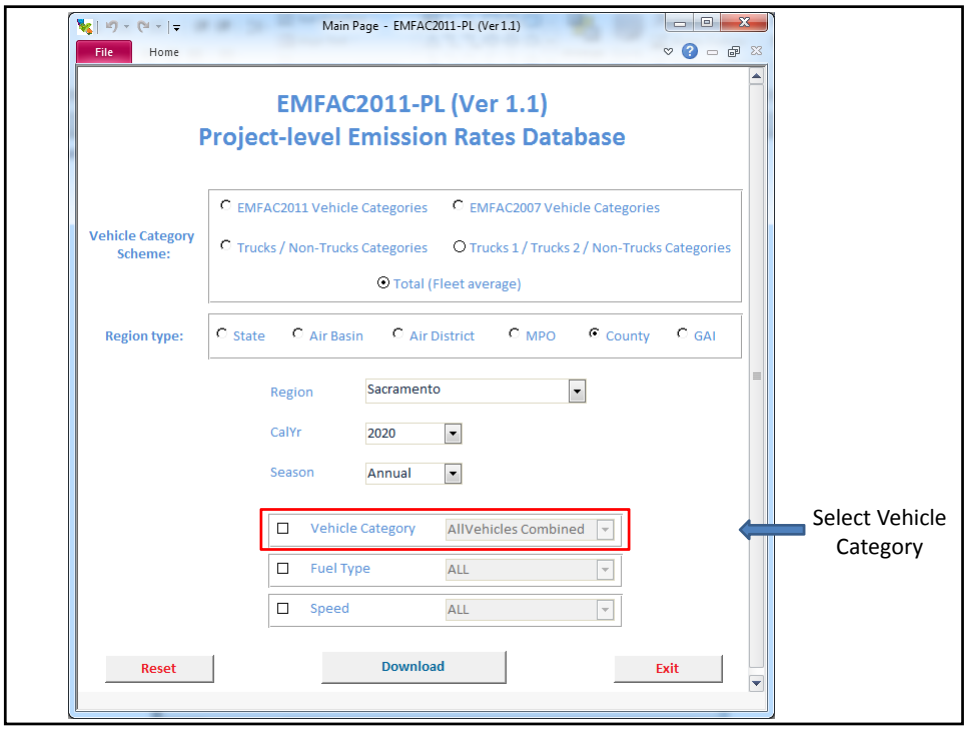
Download
Exit
Select Season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EMFAC2011-PL (Ver 1.1)
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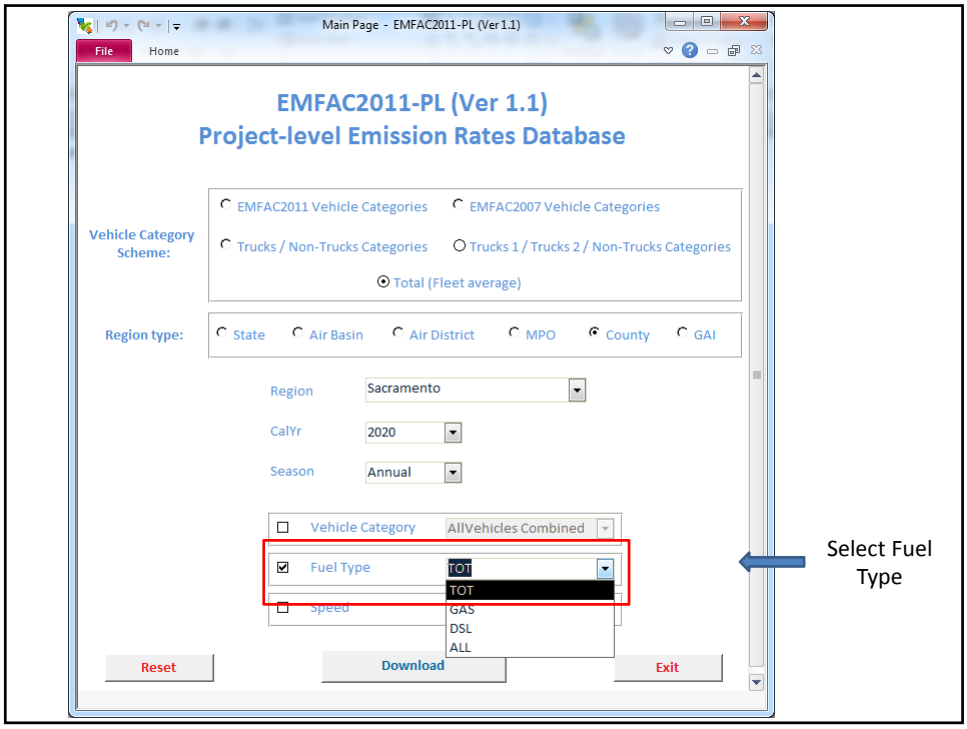
State
Air Basin
Air District
MPO
County
GAI
Region
Sacramento
CalYr
2020
Season
Annual
Vehicle Category
AllVehicles Combined
Fuel Type
ALL
Speed
ALL
Reset
Download
Exit
Select Vehicle Category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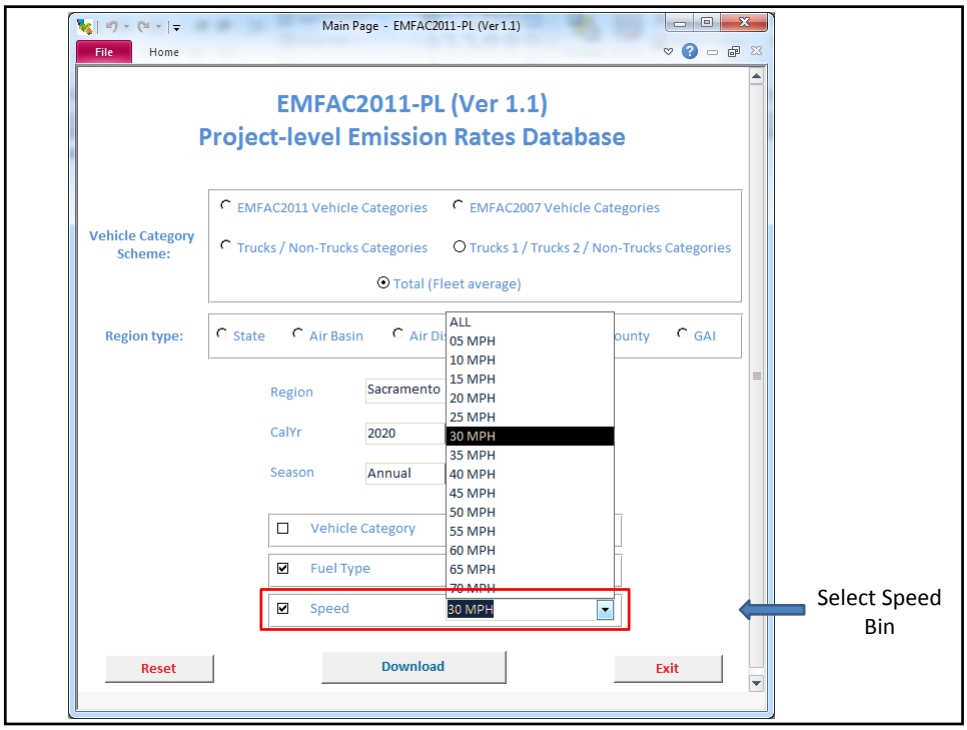
Total (Fleet average)
Region type:
State
Air Basin
Air District
MPO
County
GAI
Region
Sacramento
CalYr
2020
Season
Annual
Vehicle Category
AllVehicles Combined
Fuel Type
TOT
TOT
GAS
DSL
ALL
Speed
Reset
Download
Exit
Select Fuel Type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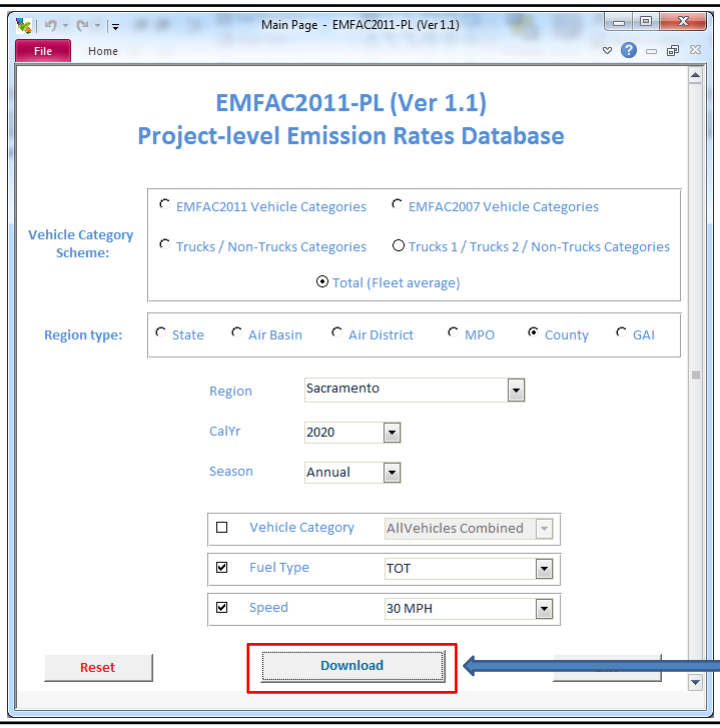
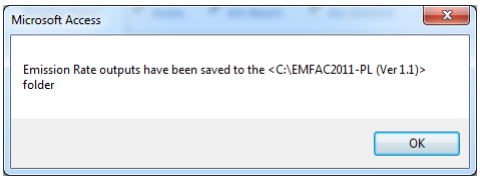
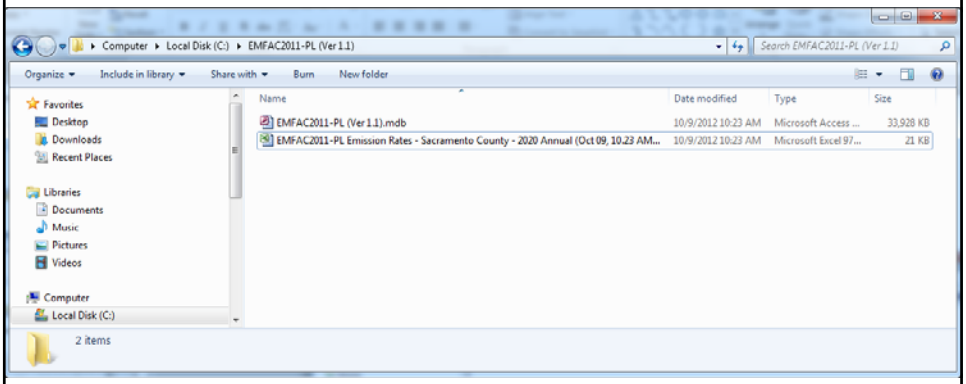
Total (Fleet average)
Region type:
State
Air Basin
GAI
Region
Sacramento
CalYr
2020
Season
Annual
Vehicle Category
Fuel Type
Speed
30 MPH
ALL
05 MPH
10 MPH
15 MPH
20 MPH
25 MPH
30 MPH
35 MPH
40 MPH
45 MPH
50 MPH
55 MPH
60 MPH
65 MPH
70 MPH
Reset
Download
Exit
Select Speed Bin



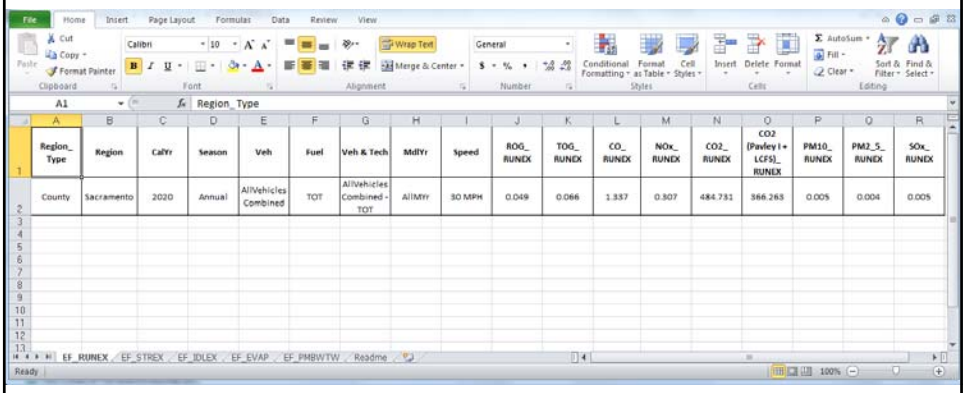
Process Completion Message



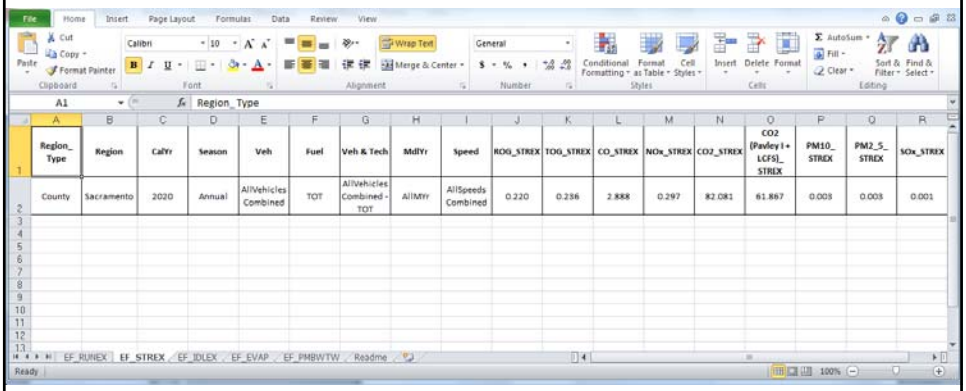
Output



ER: Running Exhaust (RUNEX)

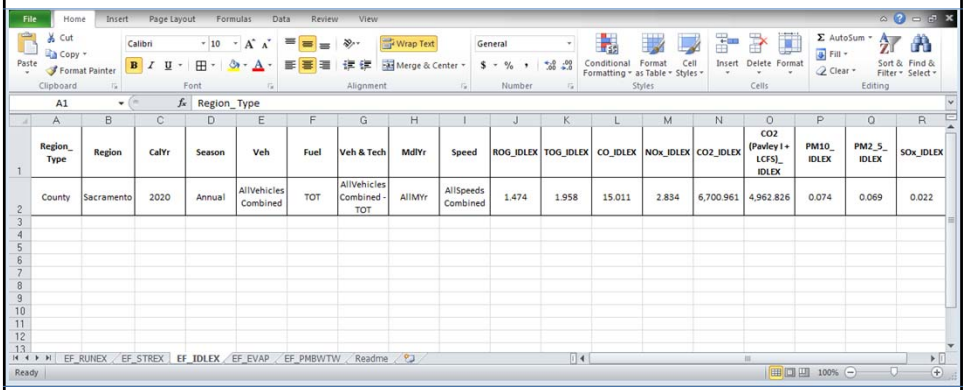


ER: Starting Exhaust (STREX)



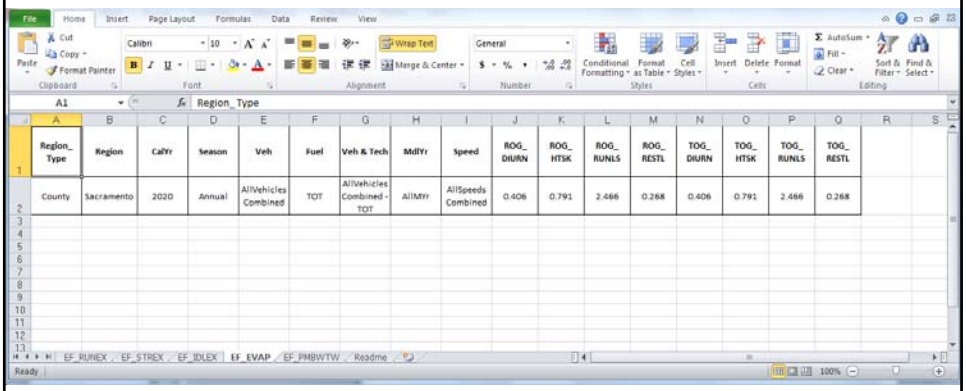
Region_ Type	Region	CalYr	Season	Veh	Fuel	Veh & Tech	MdlYr	Speed	ROG_STREX	TOG_STREX	CO_STREX	NOx_STREX	CO2_STREX	CO2 (Pavley I + LCFS)_ STREX	PM10_ STREX	PM2_5_ STREX	SOx_STREX
County	Sacramento	2020	Annual	AllVehicles Combined	TOT	AllVehicles Combined - TOT	AllMYr	AllSpeeds Combined	0.220	0.236	2.888	0.297	82.081	61.867	0.003	0.003	0.001

ER: Idling Exhaust (IDLEX)



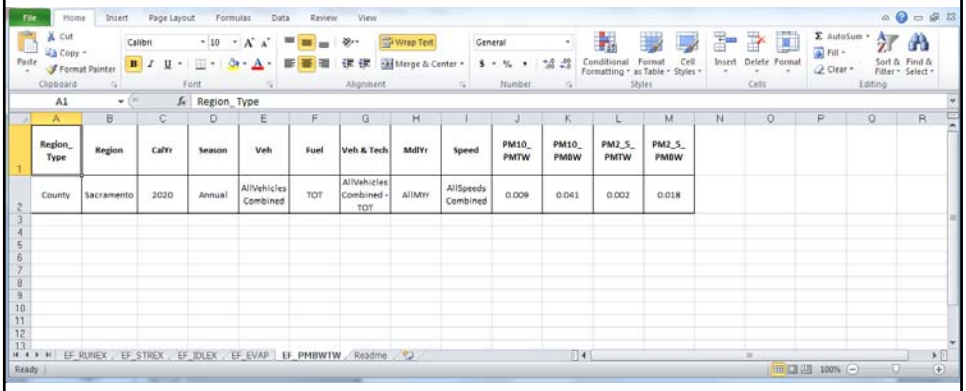
Region_ Type	Region	CalYr	Season	Veh	Fuel	Veh & Tech	MdlYr	Speed	ROG_IDLEX	TOG_IDLEX	CO_IDLEX	NOx_IDLEX	CO2_IDLEX	CO2 (Pavley I + LCFS)_ IDLEX	PM10_ IDLEX	PM2_5_ IDLEX	SOx_IDLEX
County	Sacramento	2020	Annual	AllVehicles Combined	TOT	AllVehicles Combined - TOT	AllMYr	AllSpeeds Combined	1.474	1.958	15.011	2.834	6,700.961	4,962.826	0.074	0.069	0.022

ER: Evaporative Emissions (EVAP)



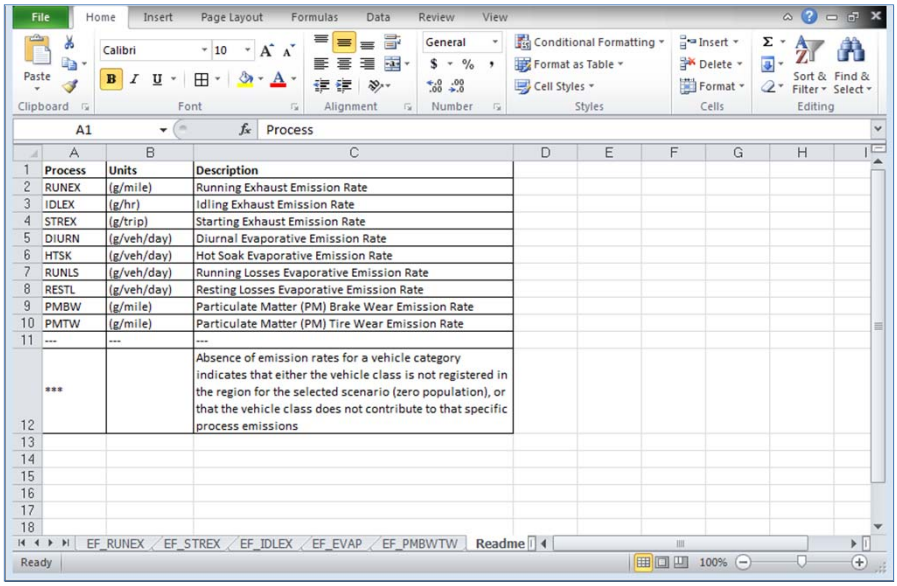
Region_ Type	Region	CalYr	Season	Veh	Fuel	Veh & Tech	MdlYr	Speed	ROG_ DIURN	ROG_ HTSK	ROG_ RUNLS	ROG_ RESTL	TOG_ DIURN	TOG_ HTSK	TOG_ RUNLS	TOG_ RESTL
County	Sacramento	2020	Annual	AllVehicles Combined	TOT	AllVehicles Combined - TOT	AllMYr	AllSpeeds Combined	0.406	0.791	2.466	0.268	0.406	0.791	2.466	0.268

ER: PM Brake + Tire Wear (PMBWTW)



Region_ Type	Region	CalYr	Season	Veh	Fuel	Veh & Tech	MdlYr	Speed	PM10_ PMTW	PM10_ PMBW	PM2_5_ PMTW	PM2_5_ PMBW
County	Sacramento	2020	Annual	AllVehicles Combined	TOT	AllVehicles Combined - TOT	AllMYr	AllSpeeds Combined	0.009	0.041	0.002	0.018

Emission Rate Description – Readme Tab

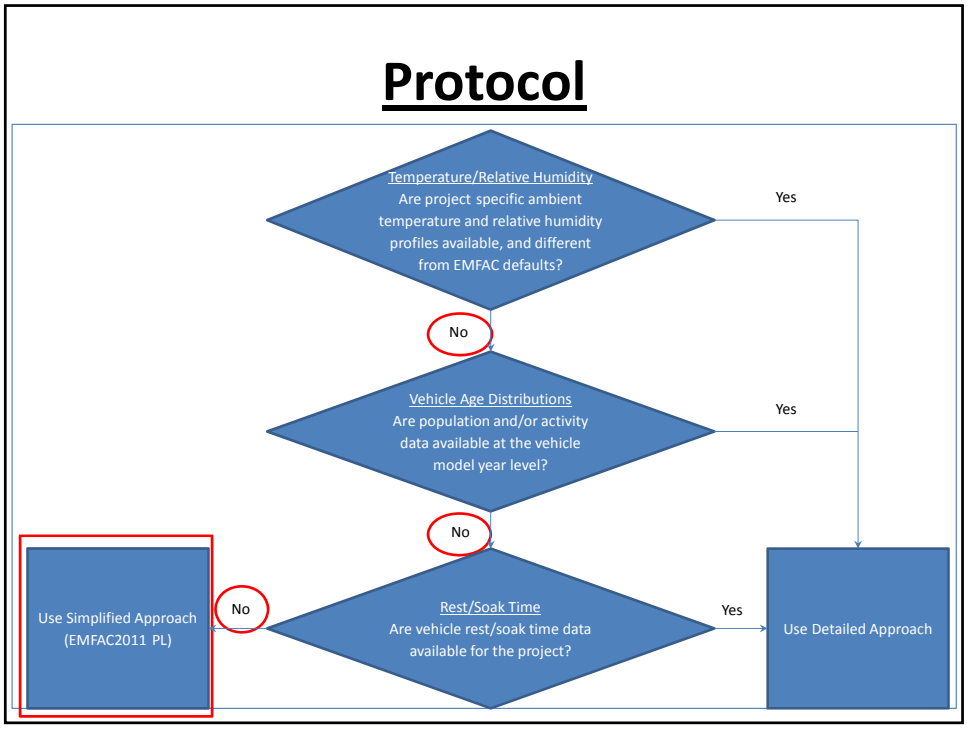


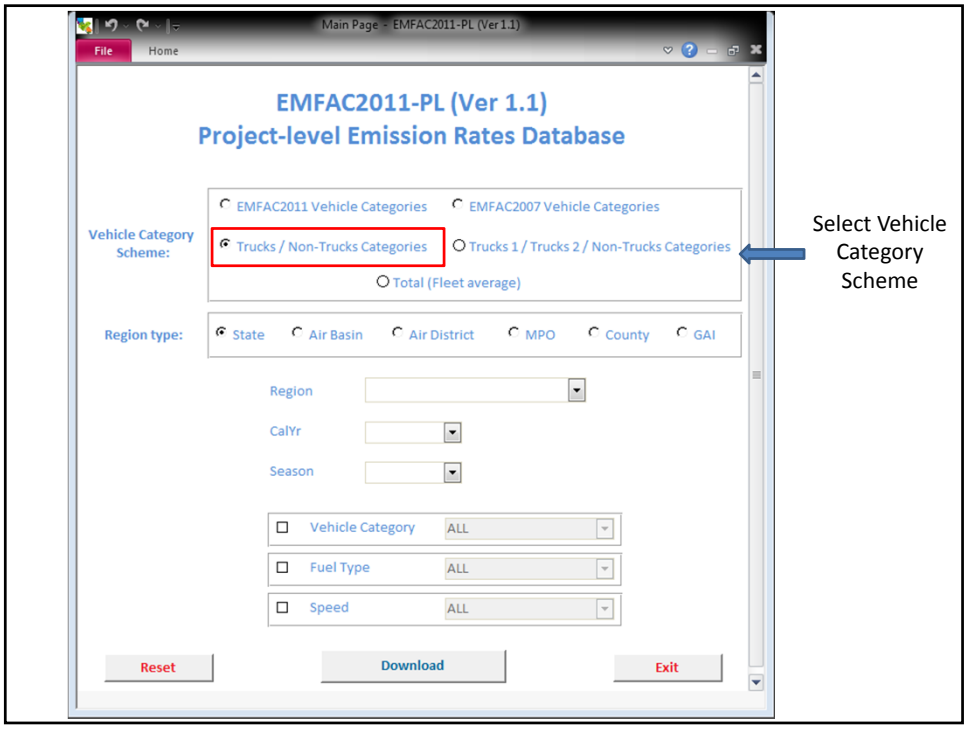
	Process	Units	Description
2	RUNEX	(g/mile)	Running Exhaust Emission Rate
3	IDLEX	(g/hr)	Idling Exhaust Emission Rate
4	STREX	(g/trip)	Starting Exhaust Emission Rate
5	DIURN	(g/veh/day)	Diurnal Evaporative Emission Rate
6	HTSK	(g/veh/day)	Hot Soak Evaporative Emission Rate
7	RUNLS	(g/veh/day)	Running Losses Evaporative Emission Rate
8	RESTL	(g/veh/day)	Resting Losses Evaporative Emission Rate
9	PMBW	(g/mile)	Particulate Matter (PM) Brake Wear Emission Rate
10	PMTW	(g/mile)	Particulate Matter (PM) Tire Wear Emission Rate
11	---	---	---
12	***		Absence of emission rates for a vehicle category indicates that either the vehicle class is not registered in the region for the selected scenario (zero population), or that the vehicle class does not contribute to that specific process emissions

SCENARIO #2 – Highway link with Non-truck Fleet

- One scenario for a highway link with non-truck vehicles only (default fleet mix)

- Provide the emission rates for the project fleet
- Vehicles: Non-truck vehicle categories only
- Fuel: All fuels with default technology distribution
- Speed: 65 MPH


Protocol
Temperature/Relative Humidity
Are project specific ambient temperature and relative humidity profiles available, and different from EMFAC defaults?
Yes
No
Vehicle Age Distributions
Are population and/or activity data available at the vehicle model year level?
Yes
No
Rest/Soak Time
Are vehicle rest/soak time data available for the project?
Yes
No
Use Simplified Approach (EMFAC2011 PL)
Use Detailed Approach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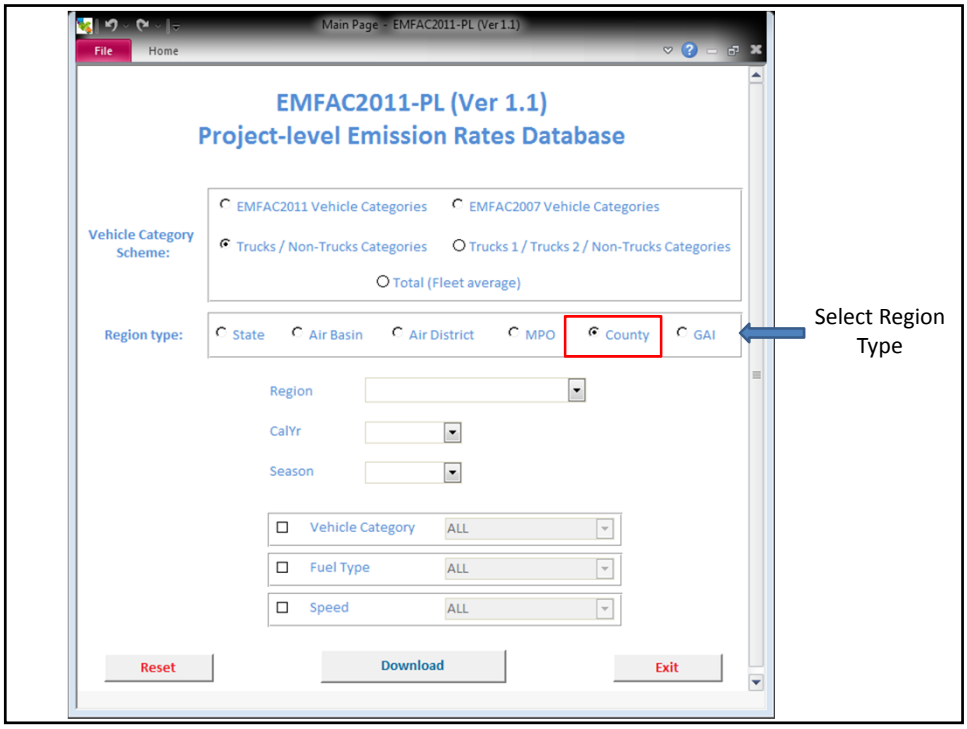
Home
EMFAC2011-PL (Ver 1.1)
Project-level Emission Rates Database
Vehicle Category Scheme:
EMFAC2011 Vehicle Categories
EMFAC2007 Vehicle Categories
Trucks / Non-Trucks Categories
Trucks 1 / Trucks 2 / Non-Trucks Categories
Total (Fleet average)
Region type:
State
Air Basin
Air District
MPO
County
GAI
Region
CalYr
Season
Vehicle Category
ALL
Fuel Type
ALL
Speed
ALL
Reset
Download
Exit
Select Vehicle Category Scheme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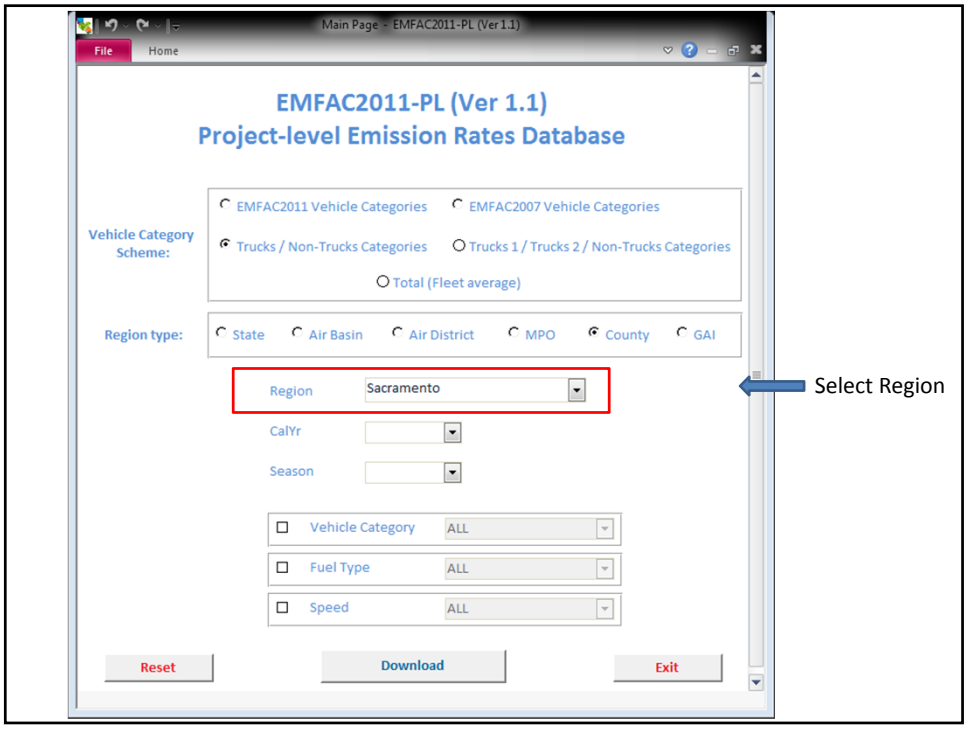
Air Basin
Air District
MPO
County
GAI
Region
CalYr
Season
Vehicle Category
ALL
Fuel Type
ALL
Speed
ALL
Reset
Download
Exit
Select Region Type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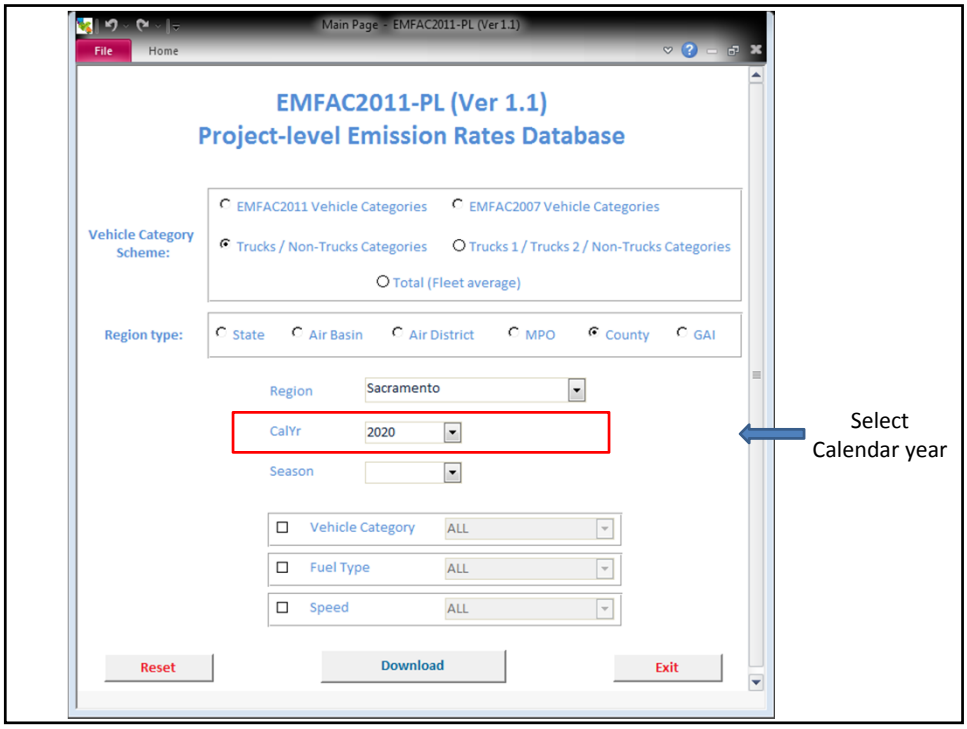
Air Basin
Air District
MPO
County
GAI
Region
Sacramento
CalYr
Season
Vehicle Category
ALL
Fuel Type
ALL
Speed
ALL
Reset
Download
Exit
Select Region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GAI
Region
Sacramento
CalYr
2020
Season
Vehicle Category
ALL
Fuel Type
ALL
Speed
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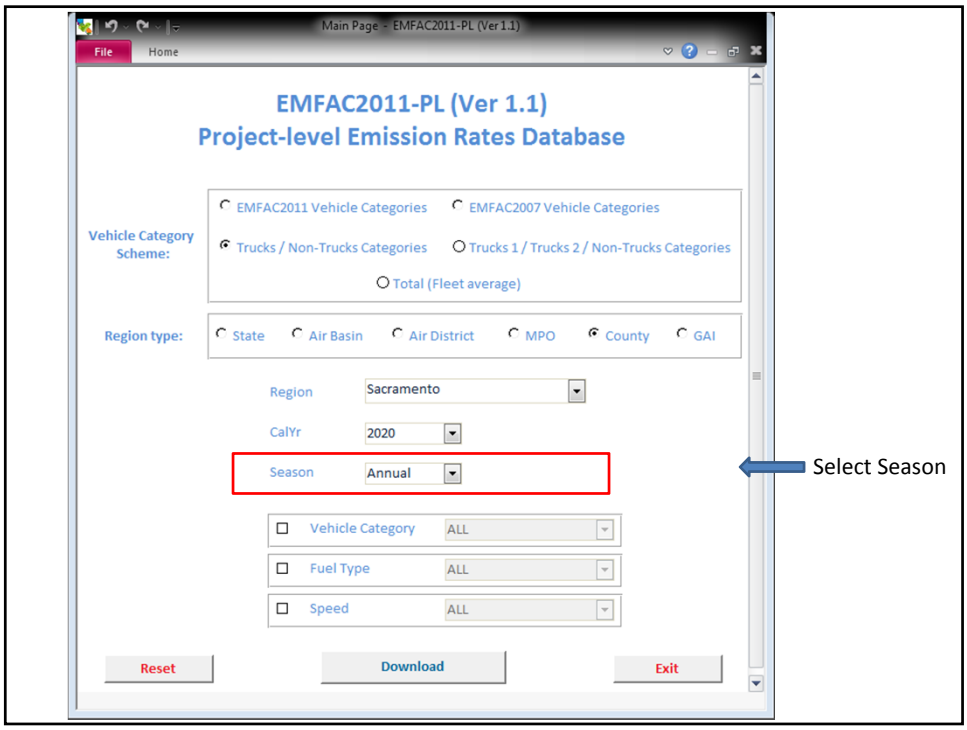
Exit
Select Calendar year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Air Basin
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MPO
County
GAI
Region
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Season
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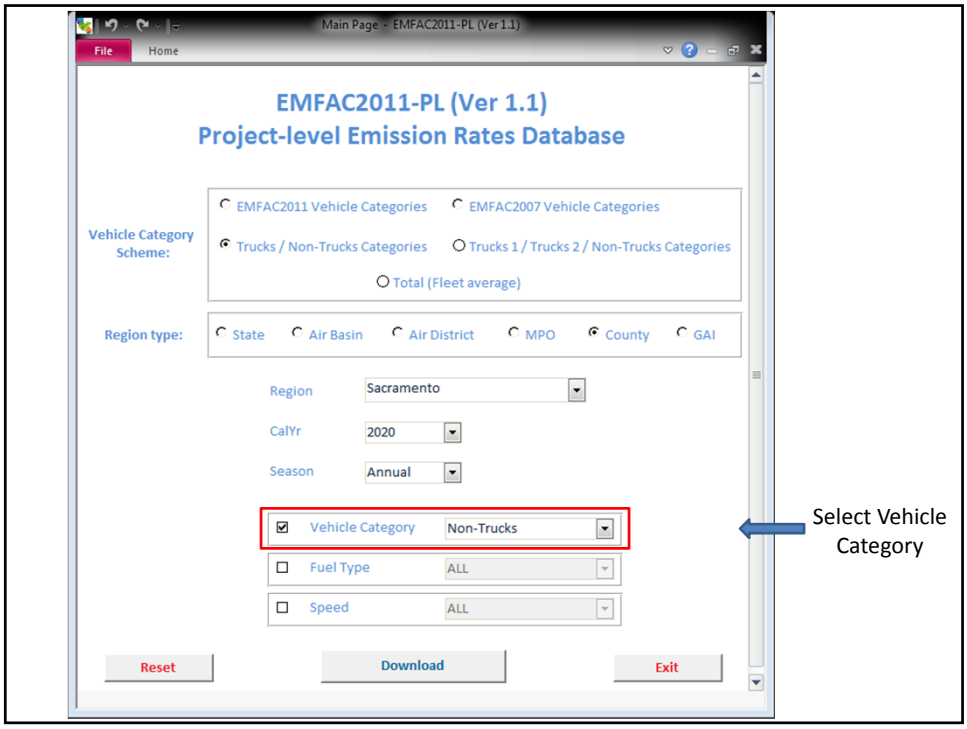
Select Season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County
GAI
Region
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CalYr
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Season
Annual
Vehicle Category
Non-Trucks
Fuel Type
ALL
Speed
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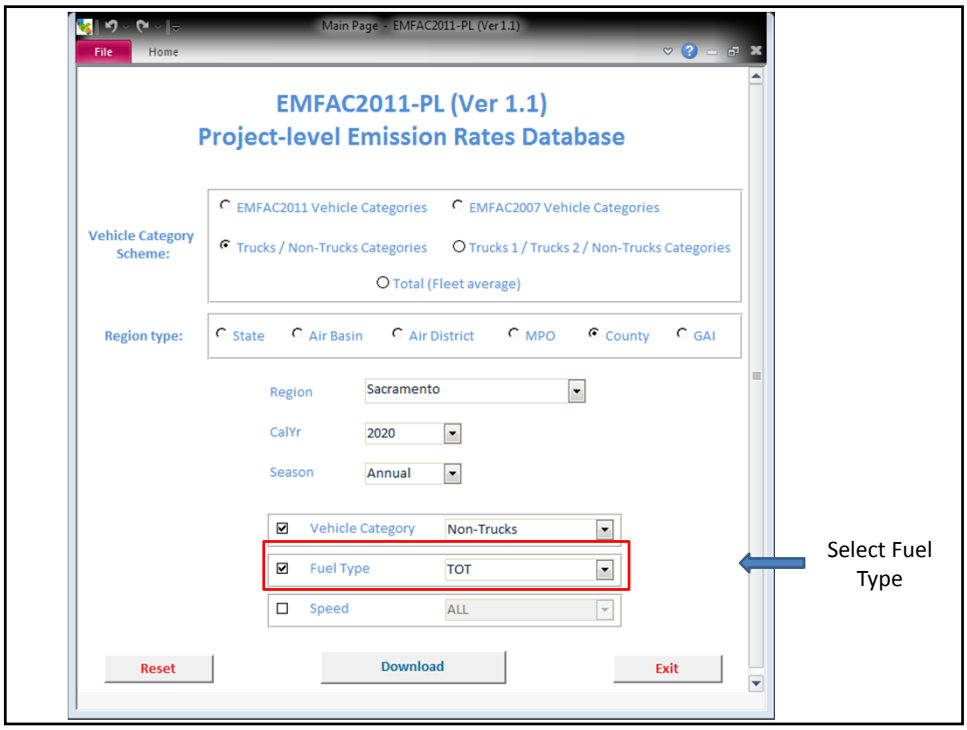
Select Vehicle Category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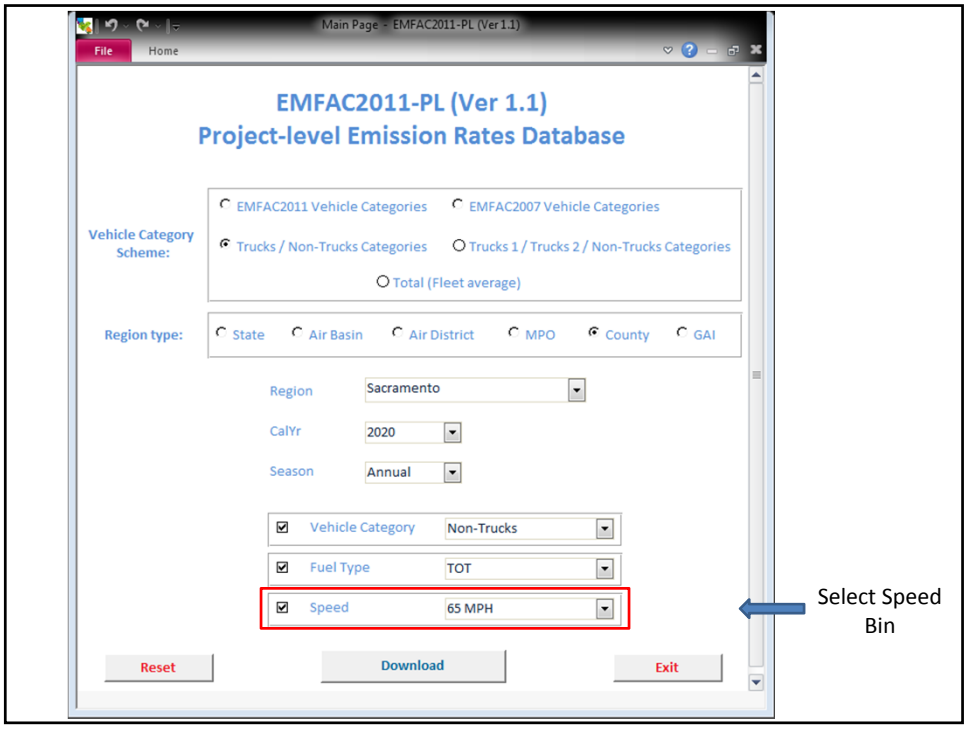
Air Basin
Air District
MPO
County
GAI
Region
Sacramento
CalYr
2020
Season
Annual
Vehicle Category
Non-Trucks
Fuel Type
TOT
Speed
ALL
Reset
Download
Exit
Select Fuel Type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GAI
Region
Sacramento
CalYr
2020
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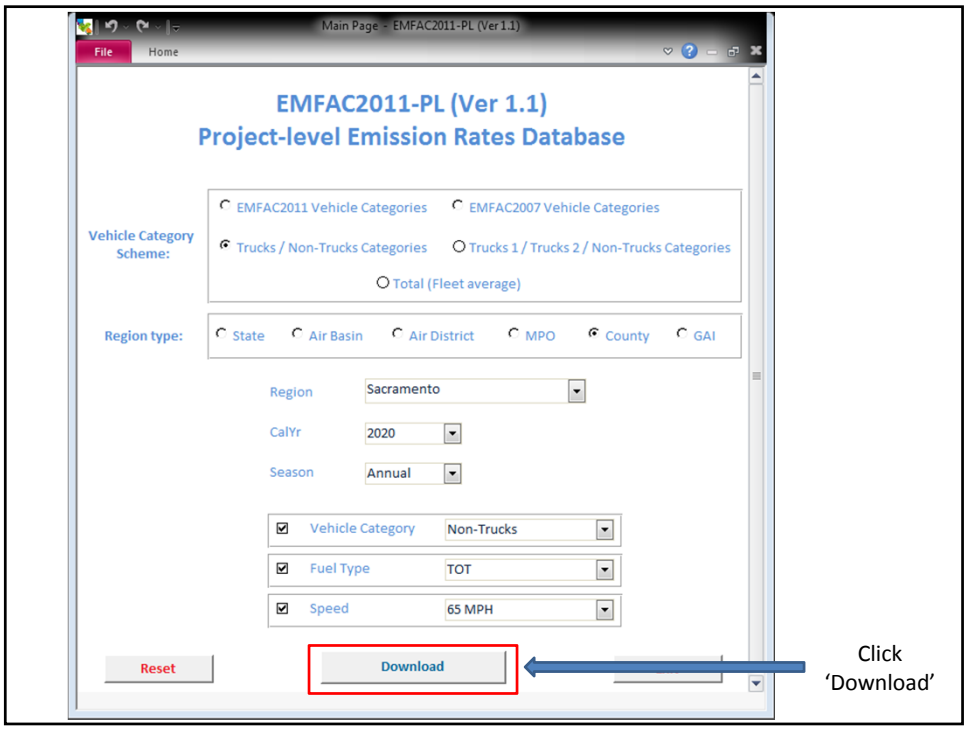
Annual
Vehicle Category
Non-Trucks
Fuel Type
TOT
Speed
65 MPH
Reset
Download
Exit
Select Speed Bin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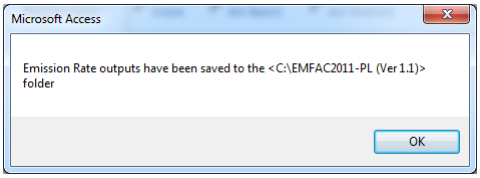
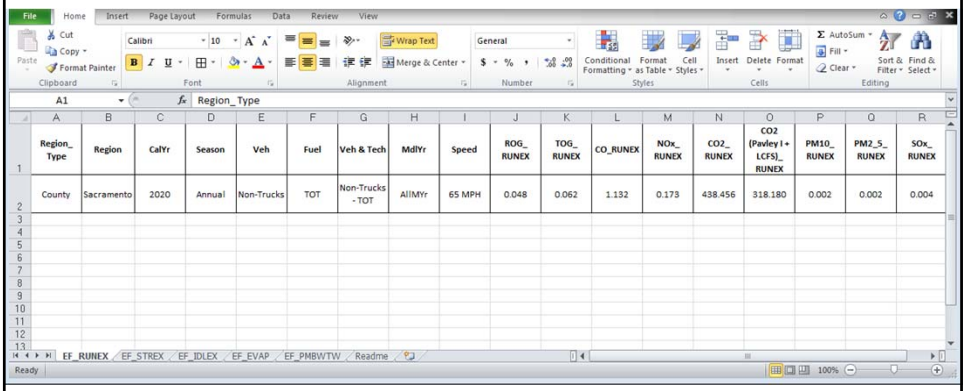
2020
Season
Annual
Vehicle Category
Non-Trucks
Fuel Type
TOT
Speed
65 MPH
Reset
Download
Click 'Download'

Process Completion Message

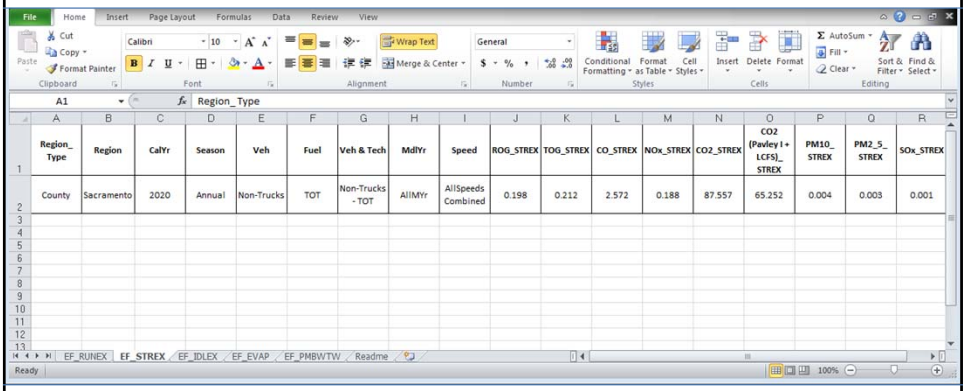


ER: Running Exhaust (RUNEX)



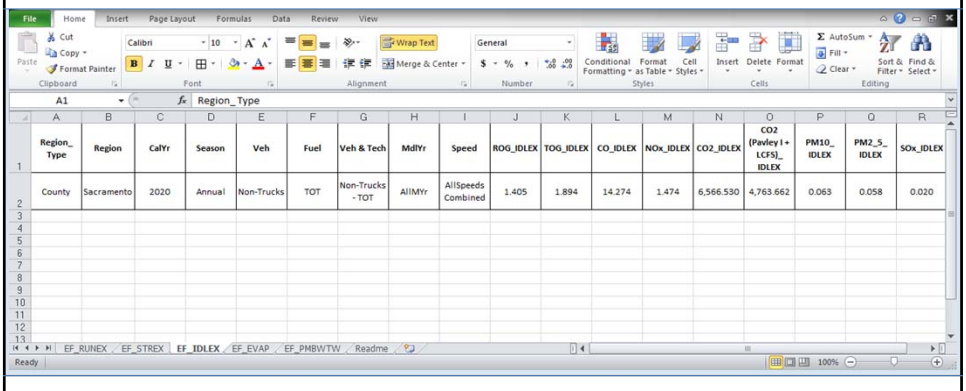
Region_ Type	Region	CalYr	Season	Veh	Fuel	Veh & Tech	MdlYr	Speed	ROG_ RUNEX	TOG_ RUNEX	CO_RUNEX	NOx_ RUNEX	CO2_ RUNEX	CO2 (Pavley I + LCFS)_ RUNEX	PM10_ RUNEX	PM2_5_ RUNEX	SOx_ RUNEX
County	Sacramento	2020	Annual	Non-Trucks	TOT	Non-Trucks - TOT	AllMYr	65 MPH	0.048	0.062	1.132	0.173	438.456	318.180	0.002	0.002	0.004

ER: Starting Exhaust (STREX)



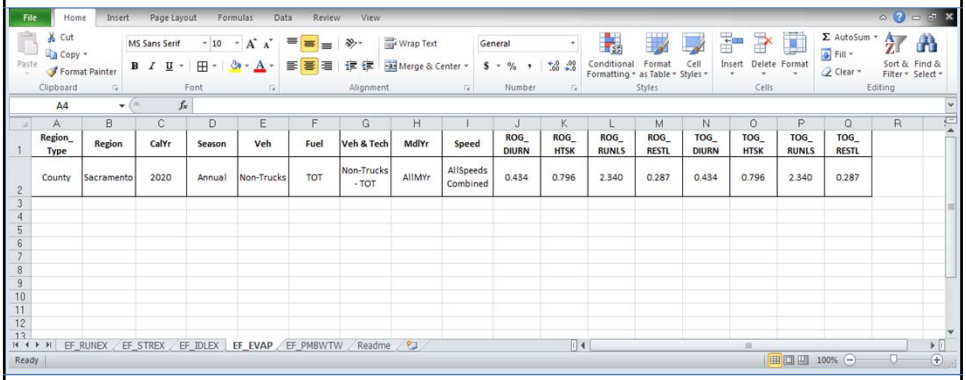
Region_ Type	Region	CalYr	Season	Veh	Fuel	Veh & Tech	MdlYr	Speed	ROG_STREX	TOG_STREX	CO_STREX	NOx_STREX	CO2_STREX	CO2 (Pavley I + LCFS)_ STREX	PM10_ STREX	PM2_5_ STREX	SOx_STREX
County	Sacramento	2020	Annual	Non-Trucks	TOT	Non-Trucks - TOT	AllMYr	AllSpeeds Combined	0.198	0.212	2.572	0.188	87.557	65.252	0.004	0.003	0.001

ER: Idling Exhaust (IDLEX)



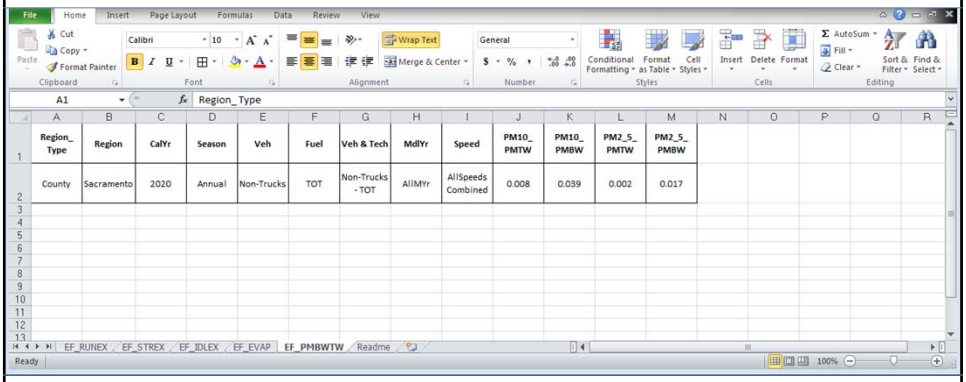
Region_ Type	Region	CalYr	Season	Veh	Fuel	Veh & Tech	MdlYr	Speed	ROG_IDLEX	TOG_IDLEX	CO_IDLEX	NOx_IDLEX	CO2_IDLEX	CO2 (Pavley I + LCFS)_ IDLEX	PM10_ IDLEX	PM2_5_ IDLEX	SOx_IDLEX
County	Sacramento	2020	Annual	Non-Trucks	TOT	Non-Trucks - TOT	AllMYr	AllSpeeds Combined	1.405	1.894	14.274	1.474	6,566.530	4,763.662	0.063	0.058	0.020

ER: Evaporative Emissions (EVAP)



Region_ Type	Region	CalYr	Season	Veh	Fuel	Veh & Tech	MdlYr	Speed	ROG_ DIURN	ROG_ HTSK	ROG_ RUNLS	ROG_ RESTL	TOG_ DIURN	TOG_ HTSK	TOG_ RUNLS	TOG_ RESTL
County	Sacramento	2020	Annual	Non-Trucks	TOT	Non-Trucks - TOT	AllMYr	AllSpeeds Combined	0.434	0.796	2.340	0.287	0.434	0.796	2.340	0.287

ER: PM Brake + Tire Wear (PMBWTW)

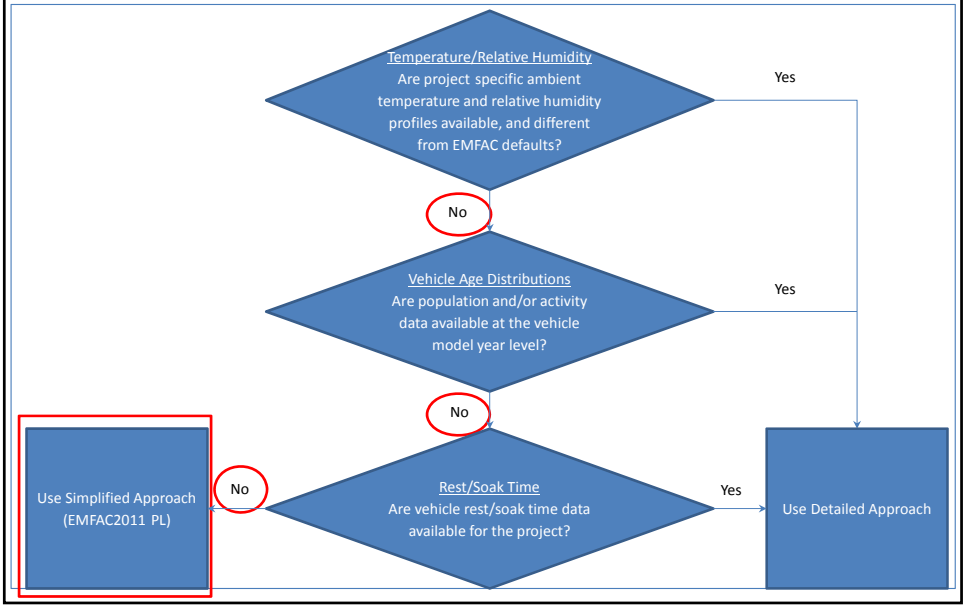


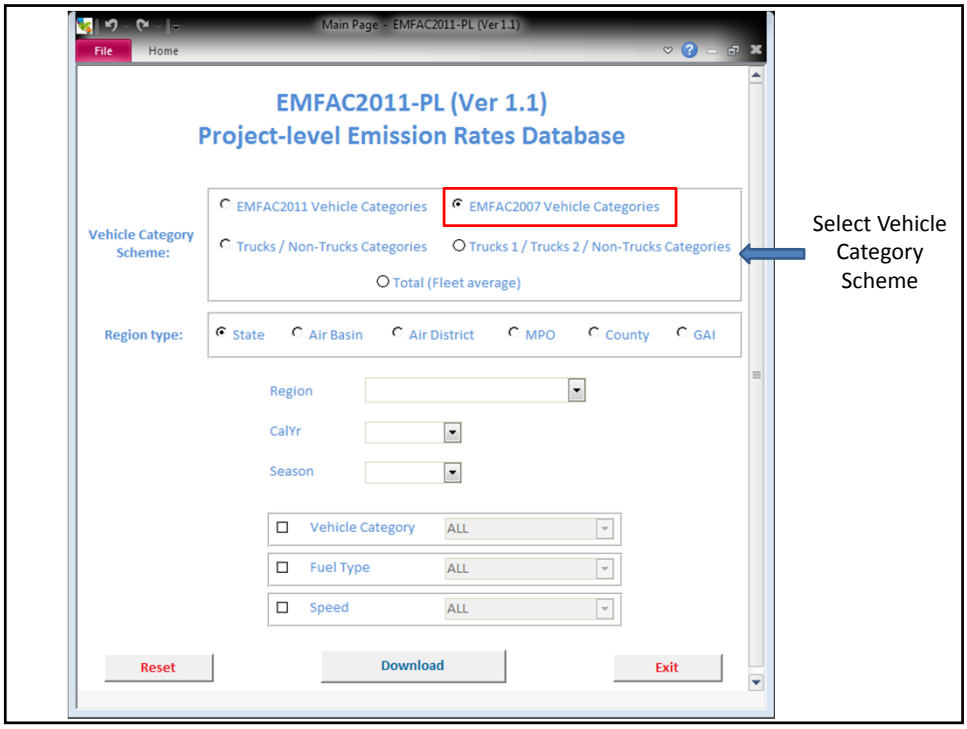
Region_ Type	Region	CalYr	Season	Veh	Fuel	Veh & Tech	MdlYr	Speed	PM10_ PMTW	PM10_ PMBW	PM2_5_ PMTW	PM2_5_ PMBW
County	Sacramento	2020	Annual	Non-Trucks	TOT	Non-Trucks - TOT	AllMYr	AllSpeeds Combined	0.008	0.039	0.002	0.017

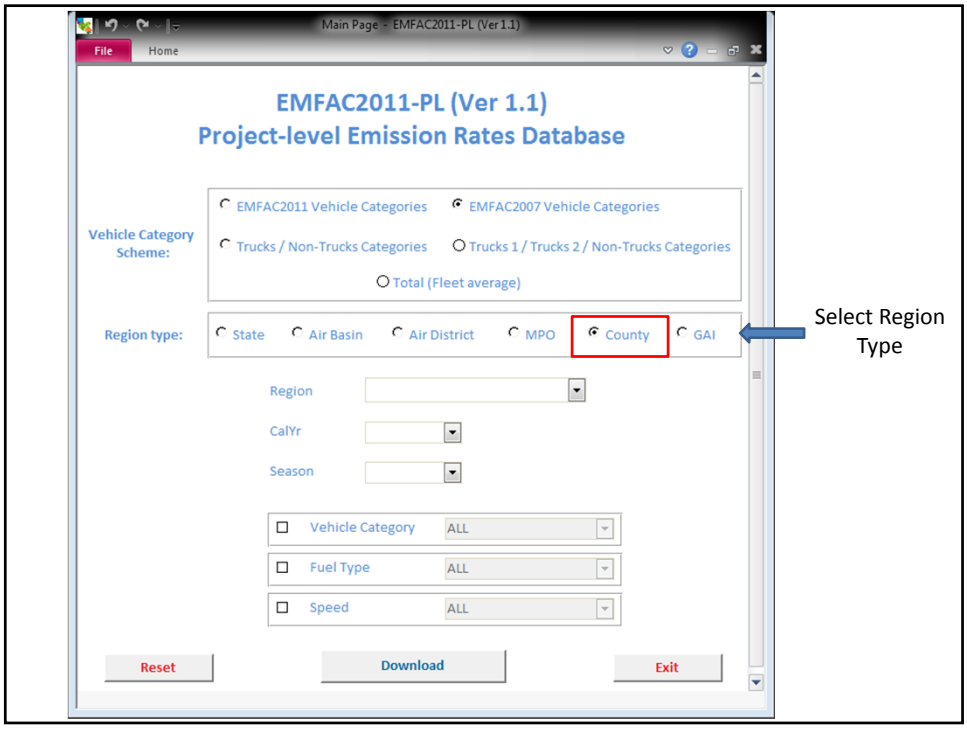
SCENARIO #3 – Transit Bus-only Running Links

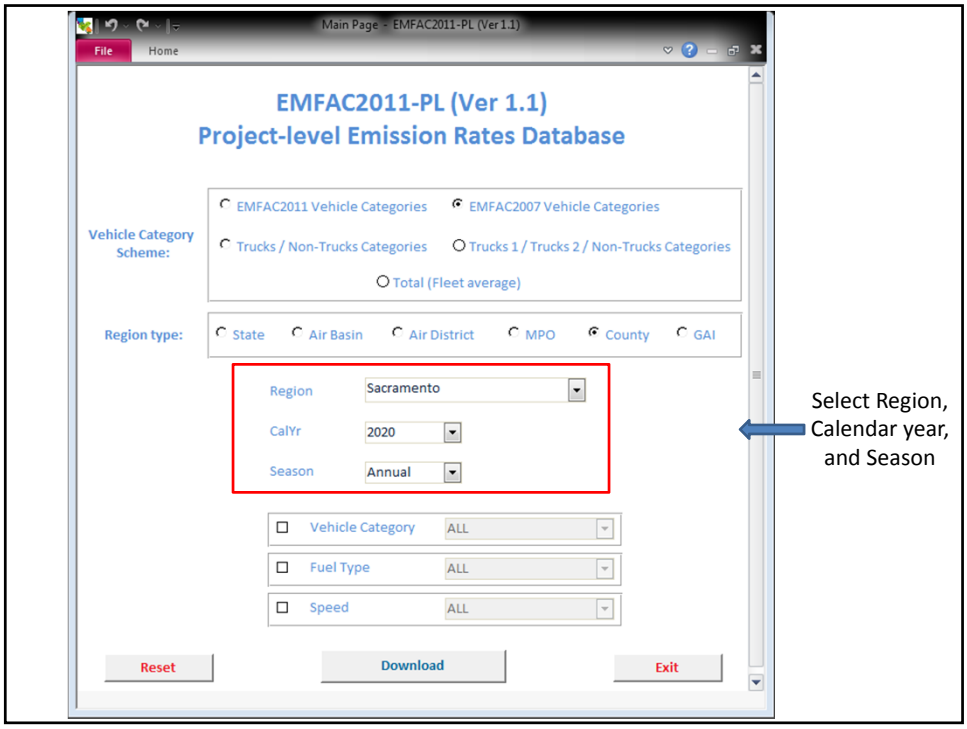
- One scenario for transit bus-only running links (default fleet mix)
- Provide the emission rates for the project's arterials.
- Vehicles: UBUS-DSL only
- Speed: 65 MPH

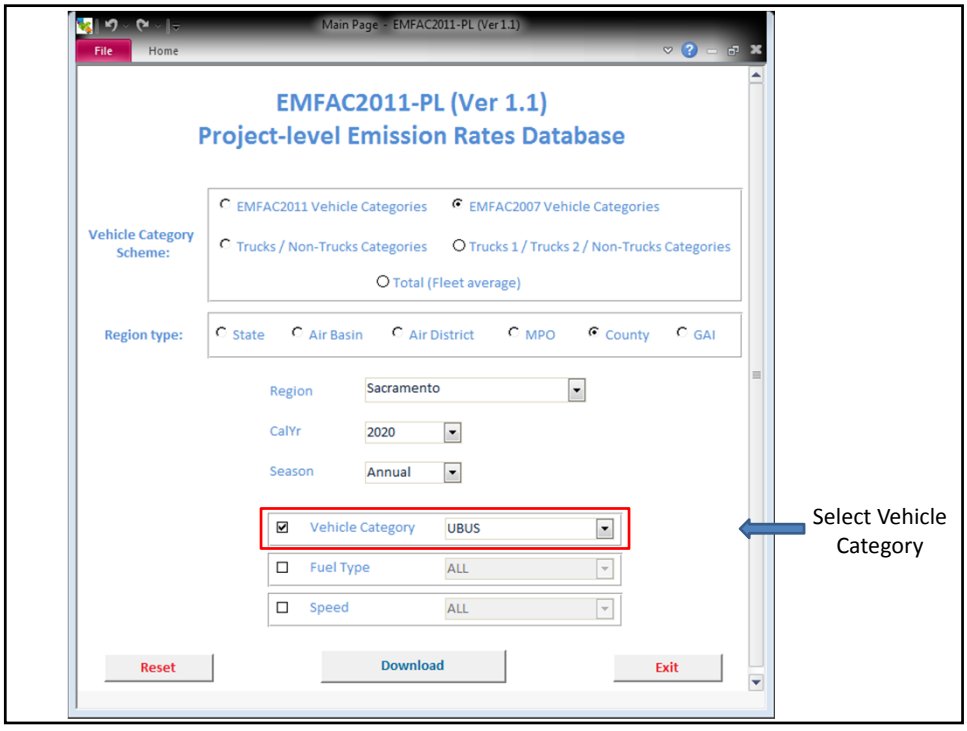
Protocol




Main Page - EMFAC2011-PL (Ver1.1)
File
Home
EMFAC2011-PL (Ver 1.1)
Project-level Emission Rates Database
Vehicle Category Scheme:
EMFAC2011 Vehicle Categories
EMFAC2007 Vehicle Categories
Trucks / Non-Trucks Categories
Trucks 1 / Trucks 2 / Non-Trucks Categories
Total (Fleet average)
Region type:
State
Air Basin
Air District
MPO
County
GAI
Region
CalYr
Season
Vehicle Category
ALL
Fuel Type
ALL
Speed
ALL
Reset
Download
Exit
Select Vehicle Category Scheme


Main Page - EMFAC2011-PL (Ver1.1)
File
Home
EMFAC2011-PL (Ver 1.1)
Project-level Emission Rates Database
Vehicle Category Scheme:
EMFAC2011 Vehicle Categories
EMFAC2007 Vehicle Categories
Trucks / Non-Trucks Categories
Trucks 1 / Trucks 2 / Non-Trucks Categories
Total (Fleet average)
Region type:
State
Air Basin
Air District
MPO
County
GAI
Region
CalYr
Season
Vehicle Category
ALL
Fuel Type
ALL
Speed
ALL
Reset
Download
Exit
Select Region Type


Main Page - EMFAC2011-PL (Ver1.1)
File
Home
EMFAC2011-PL (Ver 1.1)
Project-level Emission Rates Database
Vehicle Category Scheme:
EMFAC2011 Vehicle Categories
EMFAC2007 Vehicle Categories
Trucks / Non-Trucks Categories
Trucks 1 / Trucks 2 / Non-Trucks Categories
Total (Fleet average)
Region type:
State
Air Basin
Air District
MPO
County
GAI
Region
Sacramento
CalYr
2020
Season
Annual
Vehicle Category
ALL
Fuel Type
ALL
Speed
ALL
Reset
Download
Exit
Select Region, Calendar year, and Season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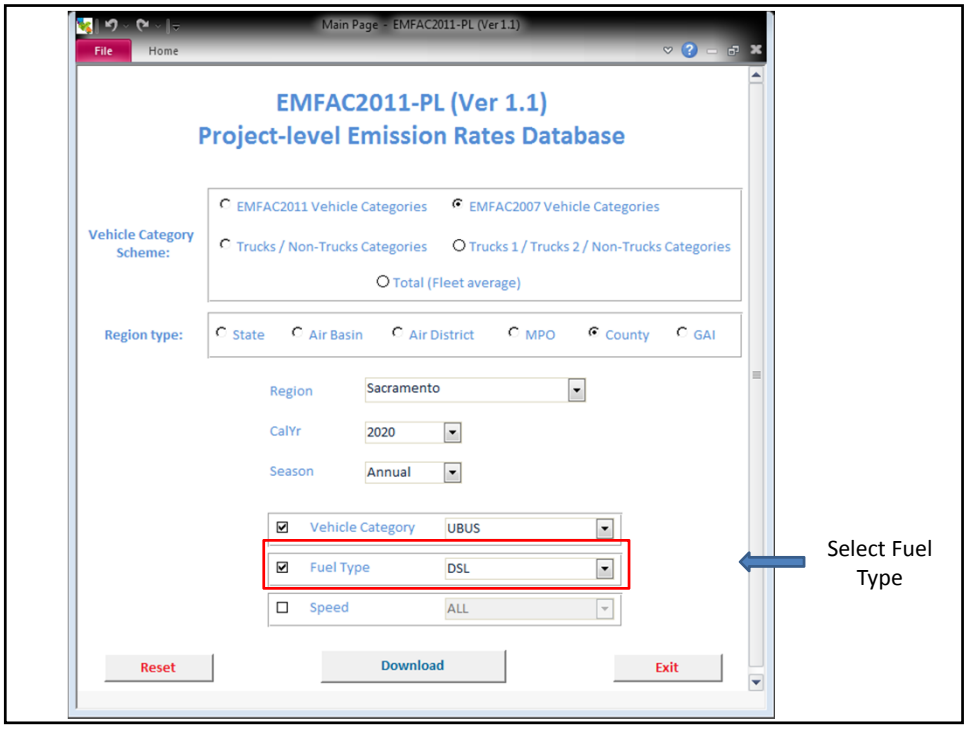
Home
EMFAC2011-PL (Ver 1.1)
Project-level Emission Rates Database
Vehicle Category Scheme:
EMFAC2011 Vehicle Categories
EMFAC2007 Vehicle Categories
Trucks / Non-Trucks Categories
Trucks 1 / Trucks 2 / Non-Trucks Categories
Total (Fleet average)
Region type:
State
Air Basin
Air District
MPO
County
GAI
Region
Sacramento
CalYr
2020
Season
Annual
Vehicle Category
UBUS
Fuel Type
ALL
Speed
ALL
Reset
Download
Exit
Select Vehicle Category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Home
EMFAC2011-PL (Ver 1.1)
Project-level Emission Rates Database
Vehicle Category Scheme:
EMFAC2011 Vehicle Categories
EMFAC2007 Vehicle Categories
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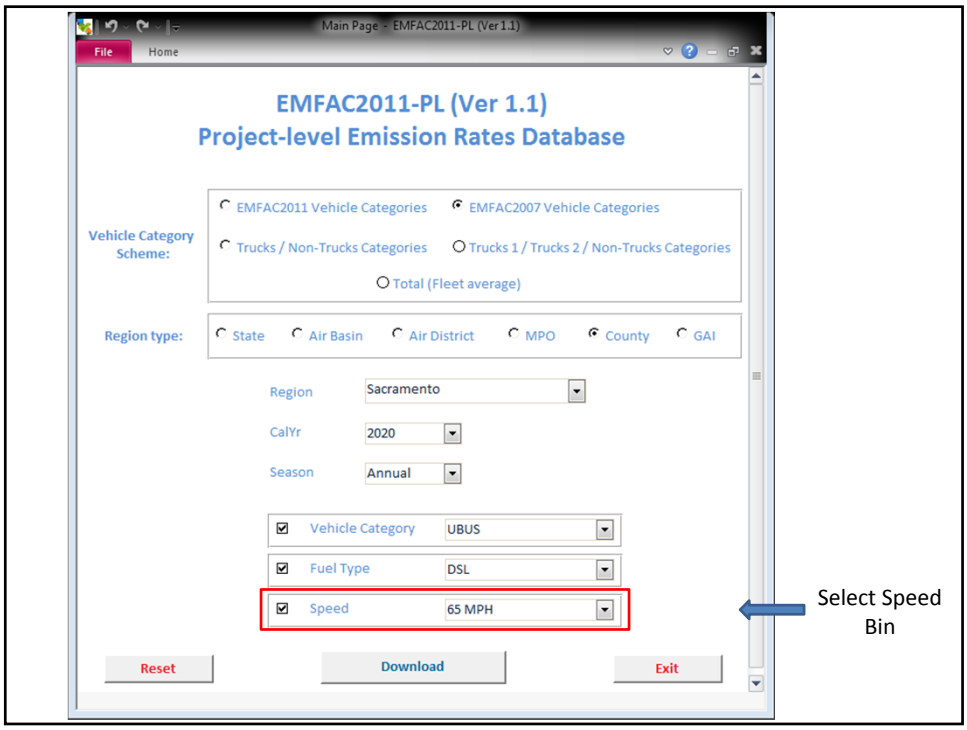
Trucks 1 / Trucks 2 / Non-Trucks Categories
Total (Fleet average)
Region type:
State
Air Basin
Air District
MPO
County
GAI
Region
Sacramento
CalYr
2020
Season
Annual
Vehicle Category
UBUS
Fuel Type
DSL
Speed
ALL
Reset
Download
Exit
Select Fuel Type


Main Page - EMFAC2011-PL (Ver1.1)
File
Home
EMFAC2011-PL (Ver 1.1)
Project-level Emission Rates Database
Vehicle Category Scheme:
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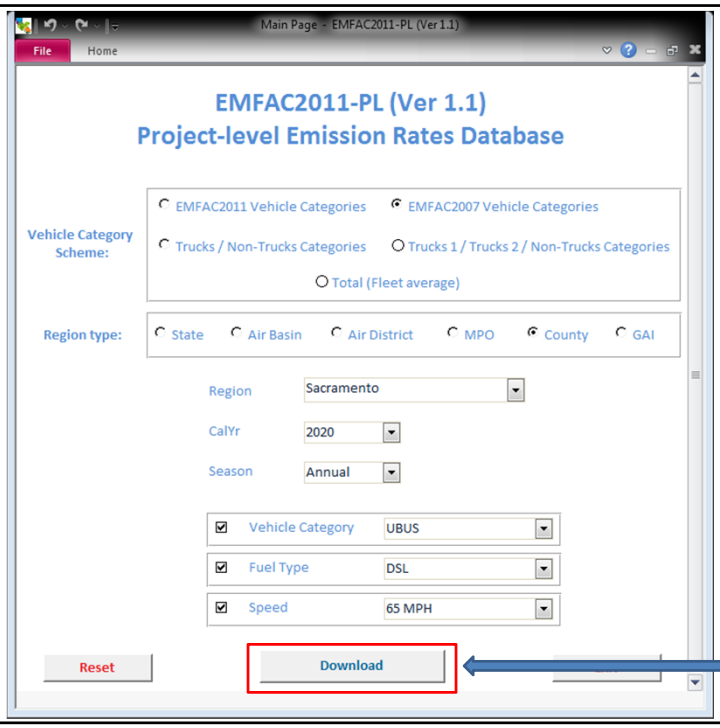
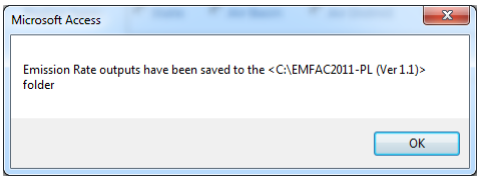
Total (Fleet average)
Region type:
State
Air Basin
Air District
MPO
County
GAI
Region
Sacramento
CalYr
2020
Season
Annual
Vehicle Category
UBUS
Fuel Type
DSL
Speed
65 MPH
Reset
Download
Exit
Select Speed Bin

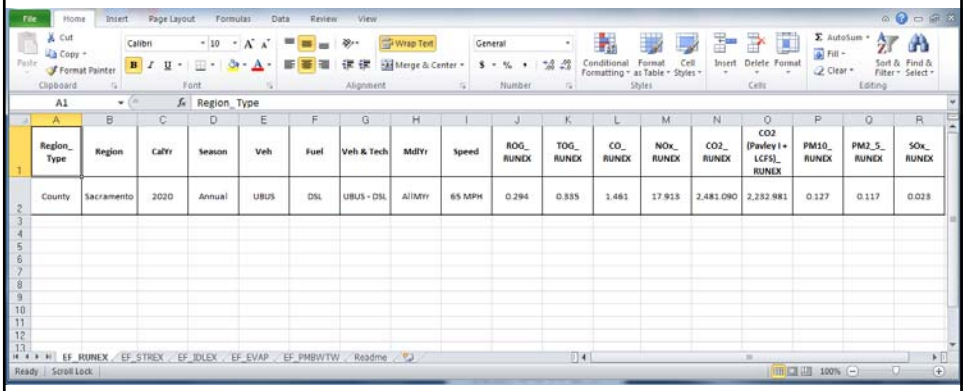


Click 'Download'

Process Completion Message

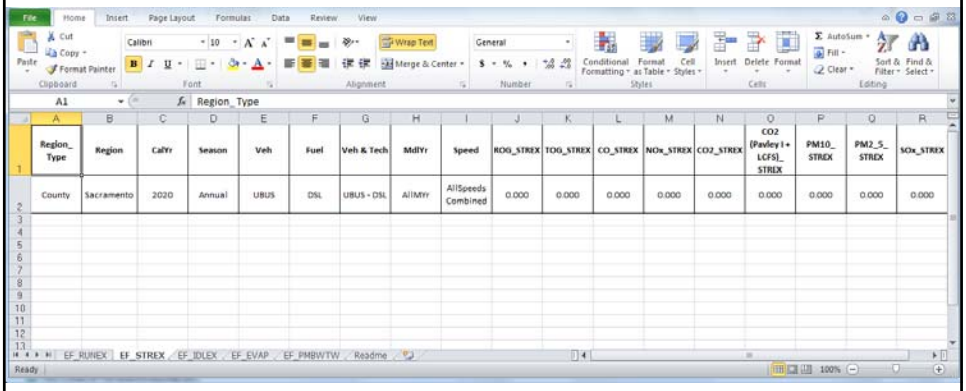


ER: Running Exhaust (RUNEX)



Region_ Type	Region	CalYr	Season	Veh	Fuel	Veh & Tech	MdlYr	Speed	ROG_ RUNEX	TOG_ RUNEX	CO_ RUNEX	NOx_ RUNEX	CO2_ RUNEX	CO2 (Pavley I + LCFS)_ RUNEX	PM10_ RUNEX	PM2_5_ RUNEX	SOx_ RUNEX
County	Sacramento	2020	Annual	UBUS	DSL	UBUS - DSL	AllMYr	65 MPH	0.294	0.335	1.461	17.918	2,481.090	2,282.981	0.127	0.117	0.028

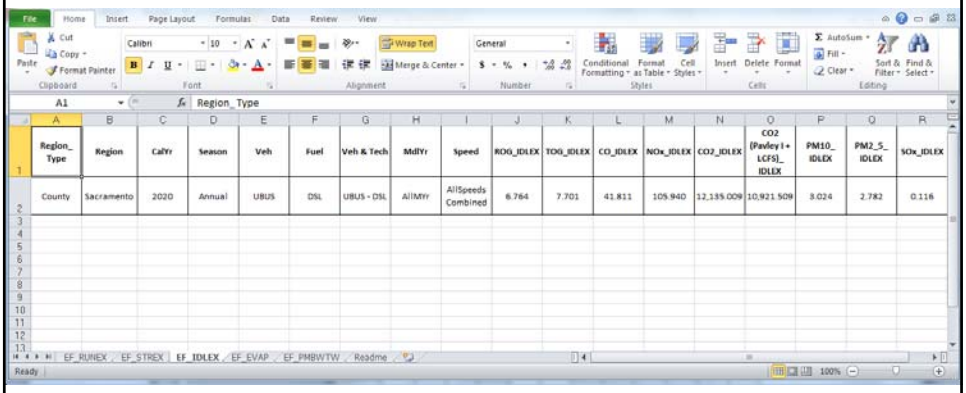
ER: Starting Exhaust (STREX)



Region_ Type	Region	CalYr	Season	Veh	Fuel	Veh & Tech	MdlYr	Speed	ROG_STREX	TOG_STREX	CO_STREX	NOx_STREX	CO2_STREX	CO2 (Pavley I + LCFS)_ STREX	PM10_ STREX	PM2_5_ STREX	SOx_STREX
County	Sacramento	2020	Annual	UBUS	DSL	UBUS - DSL	AllMYr	AllSpeeds Combined	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

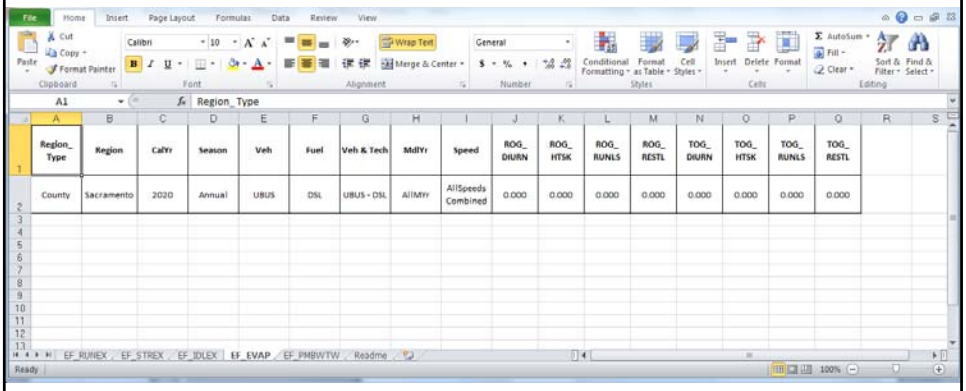
DSL vehicles do not generate separate starting emissions.
Therefore, STREX emission rates for UBUS-DSL vehicles are zero.

ER: Idling Exhaust (IDLEX)



Region_ Type	Region	CalYr	Season	Veh	Fuel	Veh & Tech	MdlYr	Speed	ROG_IDLEX	TOG_IDLEX	CO_IDLEX	NOx_IDLEX	CO2_IDLEX	CO2 (Pavley I + LCFS)_ IDLEX	PM10_ IDLEX	PM2_5_ IDLEX	SOx_IDLEX
County	Sacramento	2020	Annual	UBUS	DSL	UBUS - DSL	AllMYr	AllSpeeds Combined	6.764	7.701	41.811	105.940	12,135.009	10,921.509	3.024	2.782	0.116

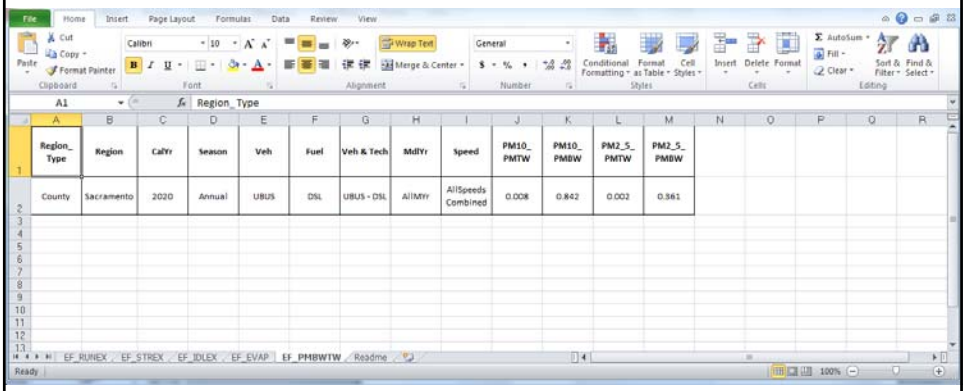
ER: Evaporative Emissions (EVAP)



Region_ Type	Region	CalYr	Season	Veh	Fuel	Veh & Tech	MdlYr	Speed	ROG_ DIURN	ROG_ HTSK	ROG_ RUNLS	ROG_ RESTL	TOG_ DIURN	TOG_ HTSK	TOG_ RUNLS	TOG_ RESTL
County	Sacramento	2020	Annual	UBUS	DSL	UBUS - DSL	AllMYr	AllSpeeds Combined	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

DSL vehicles do not generate evaporative emissions.
Therefore, EVAP emission rates for UBUS-DSL vehicles are zero.

ER: PM Brake + Tire Wear (PMBWTW)

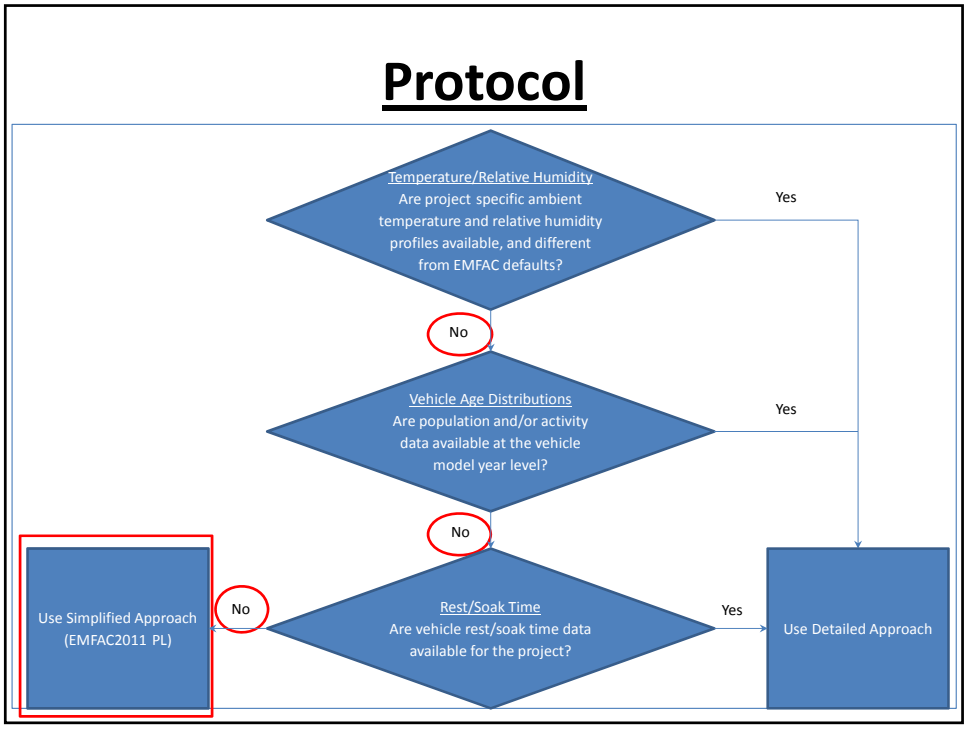


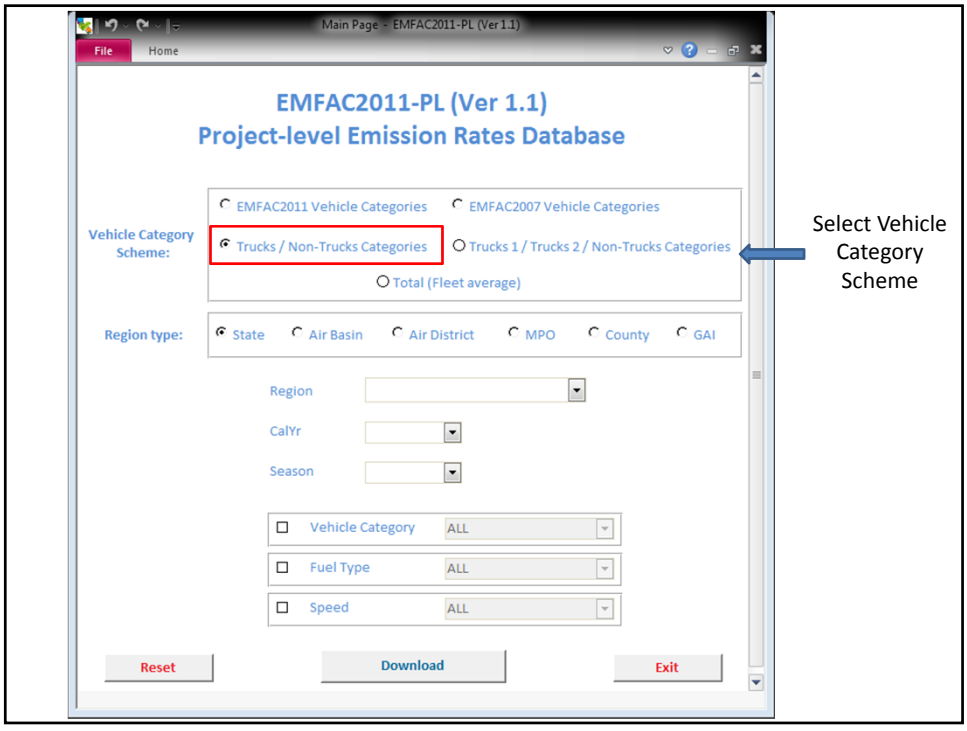
Region_ Type	Region	CalYr	Season	Veh	Fuel	Veh & Tech	MdlYr	Speed	PM10_ PMTW	PM10_ PMBW	PM2_5_ PMTW	PM2_5_ PMBW
County	Sacramento	2020	Annual	UBUS	DSL	UBUS - DSL	AllMYr	AllSpeeds Combined	0.008	0.842	0.002	0.361

SCENARIO #4: Highway link with Project-specific Fleet Mix

- One scenario for a highway link with project-specific fleet mix

- Generate emissions rates for a highway link based on the expected vehicle mix from the traffic data.
- Speed = 65 MPH
- Fuel: All fuels with default technology distribution
- Calculate Emission Factors so that population and VMT are 80% light duty and 20% heavy duty.


Protocol
Temperature/Relative Humidity
Are project specific ambient temperature and relative humidity profiles available, and different from EMFAC defaults?
Yes
No
Vehicle Age Distributions
Are population and/or activity data available at the vehicle model year level?
Yes
No
Rest/Soak Time
Are vehicle rest/soak time data available for the project?
Yes
No
Use Simplified Approach (EMFAC2011 PL)
Use Detailed Approach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EMFAC2011-PL (Ver 1.1)
Project-level Emission Rates Database
Vehicle Category Scheme:
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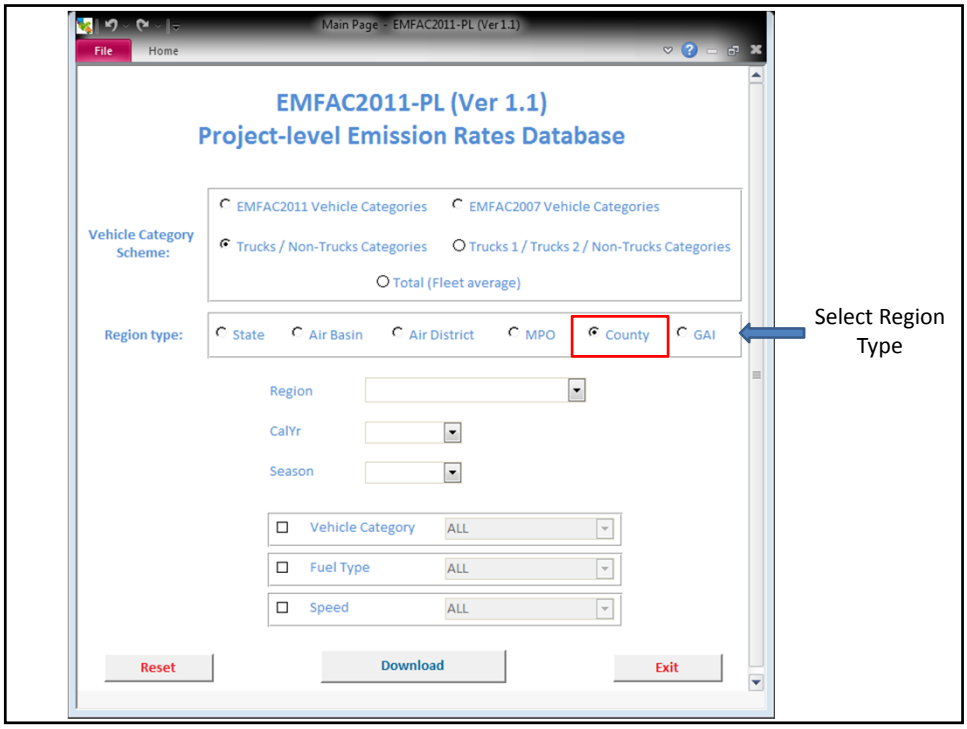
EMFAC2007 Vehicle Categories
Trucks / Non-Trucks Categories
Trucks 1 / Trucks 2 / Non-Trucks Categories
Total (Fleet average)
Region type:
State
Air Basin
Air District
MPO
County
GAI
Region
CalYr
Season
Vehicle Category
ALL
Fuel Type
ALL
Speed
ALL
Reset
Download
Exit
Select Vehicle Category Scheme


Main Page - EMFAC2011-PL (Ver1.1)
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EMFAC2011-PL (Ver 1.1)
Project-level Emission Rates Database
Vehicle Category Scheme:
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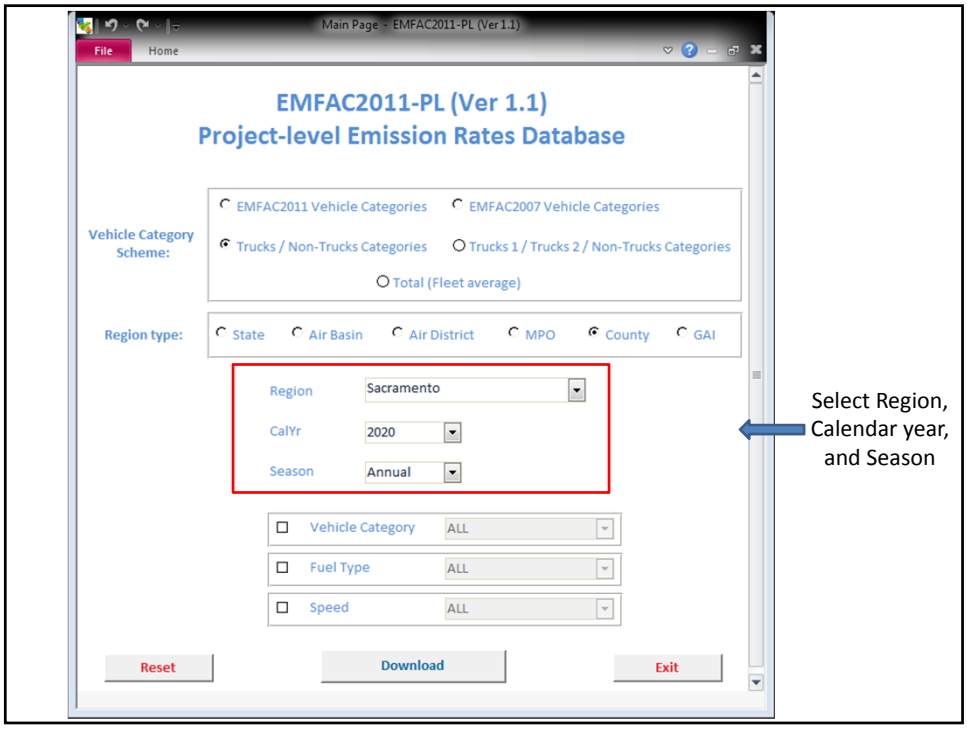
EMFAC2007 Vehicle Categories
Trucks / Non-Trucks Categories
Trucks 1 / Trucks 2 / Non-Trucks Categories
Total (Fleet average)
Region type:
State
Air Basin
Air District
MPO
County
GAI
Region
CalYr
Season
Vehicle Category
ALL
Fuel Type
ALL
Speed
ALL
Reset
Download
Exit
Select Region Type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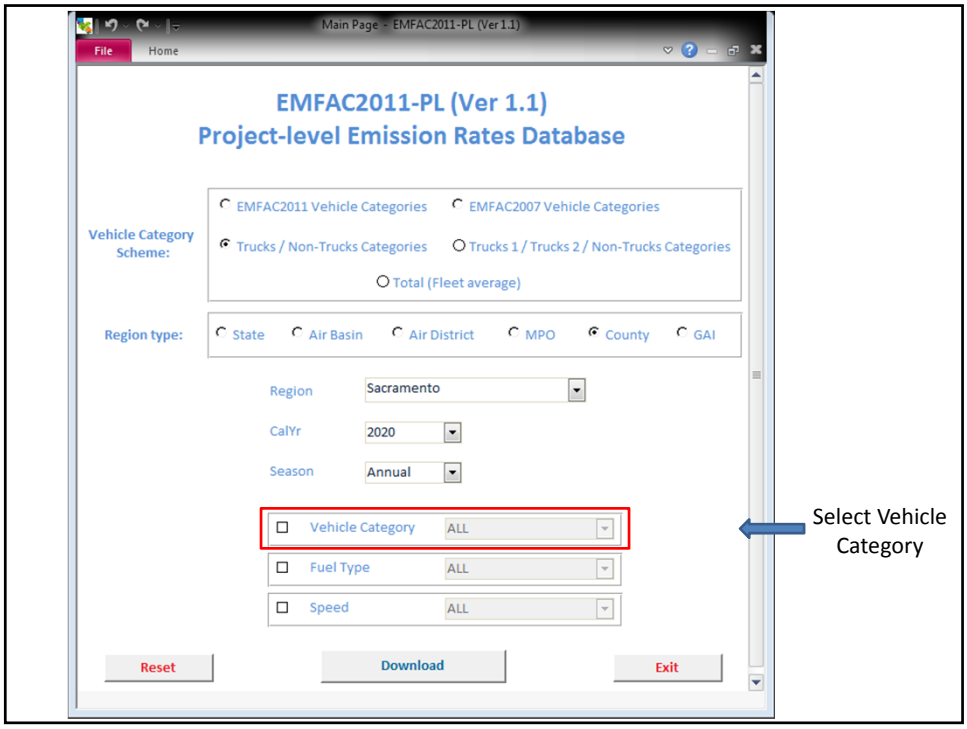
Project-level Emission Rates Database
Vehicle Category Scheme:
EMFAC2011 Vehicle Categories
EMFAC2007 Vehicle Categories
Trucks / Non-Trucks Categories
Trucks 1 / Trucks 2 / Non-Trucks Categories
Total (Fleet average)
Region type:
State
Air Basin
Air District
MPO
County
GAI
Region
Sacramento
CalYr
2020
Season
Annual
Vehicle Category
ALL
Fuel Type
ALL
Speed
ALL
Reset
Download
Exit
Select Region, Calendar year, and Season


Main Page - EMFAC2011-PL (Ver1.1)
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Home
EMFAC2011-PL (Ver 1.1)
Project-level Emission Rates Database
Vehicle Category Scheme:
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State
Air Basin
Air District
MPO
County
GAI
Region
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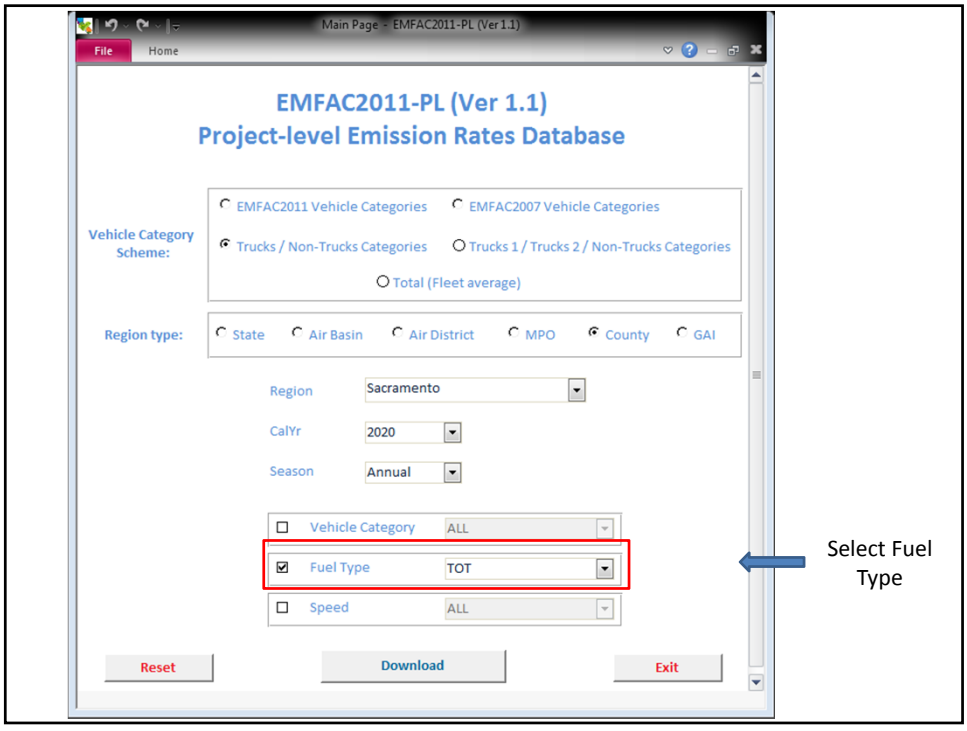
CalYr
2020
Season
Annual
Vehicle Category
ALL
Fuel Type
ALL
Speed
ALL
Reset
Download
Exit
Select Vehicle Category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EMFAC2011-PL (Ver 1.1)
Project-level Emission Rates Database
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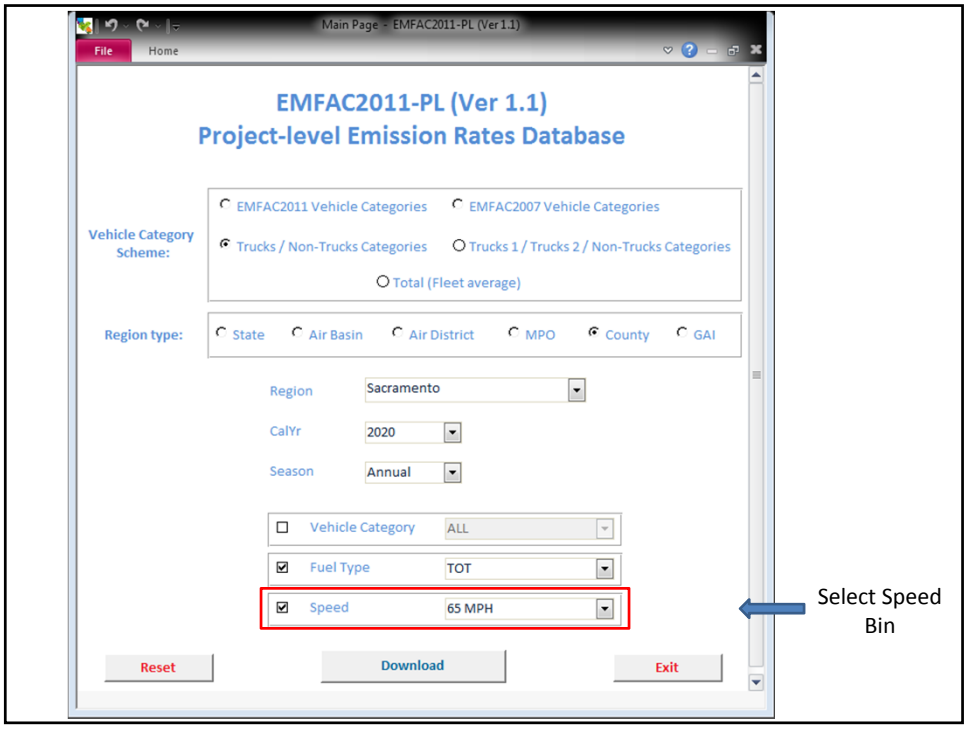
Trucks / Non-Trucks Categories
Trucks 1 / Trucks 2 / Non-Trucks Categories
Total (Fleet average)
Region type:
State
Air Basin
Air District
MPO
County
GAI
Region
Sacramento
CalYr
2020
Season
Annual
Vehicle Category
ALL
Fuel Type
TOT
Speed
ALL
Reset
Download
Exit
Select Fuel Type


Main Page - EMFAC2011-PL (Ver1.1)
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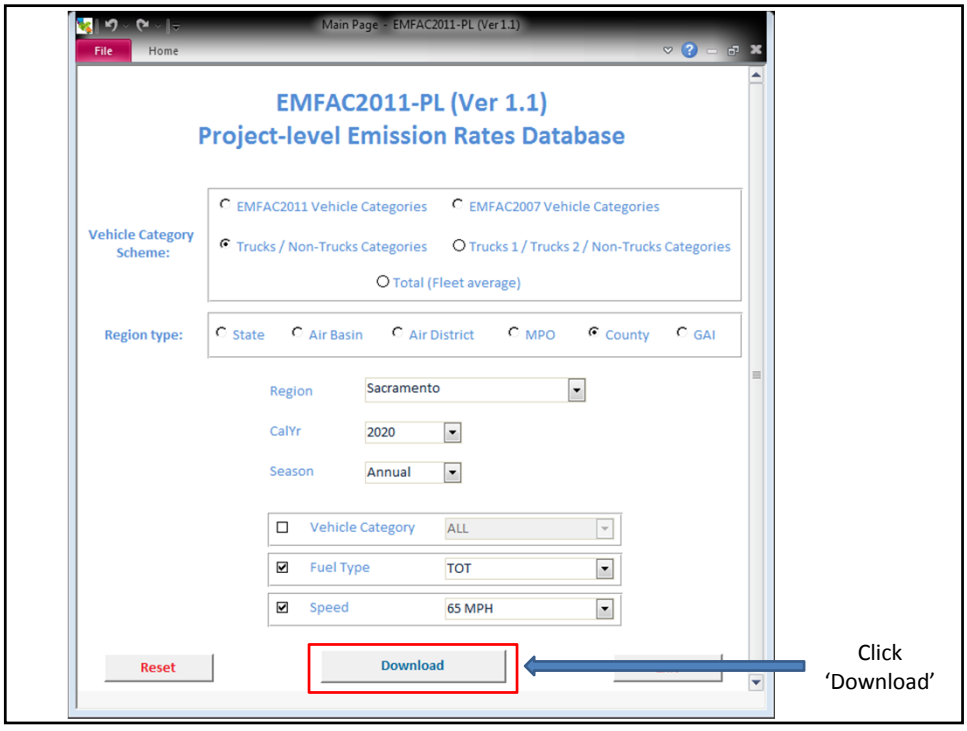
Home
EMFAC2011-PL (Ver 1.1)
Project-level Emission Rates Database
Vehicle Category Scheme:
EMFAC2011 Vehicle Categories
EMFAC2007 Vehicle Categories
Trucks / Non-Trucks Categories
Trucks 1 / Trucks 2 / Non-Trucks Categories
Total (Fleet average)
Region type:
State
Air Basin
Air District
MPO
County
GAI
Region
Sacramento
CalYr
2020
Season
Annual
Vehicle Category
ALL
Fuel Type
TOT
Speed
65 MPH
Reset
Download
Exit
Select Speed Bin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EMFAC2011-PL (Ver 1.1)
Project-level Emission Rates Database
Vehicle Category Scheme:
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EMFAC2007 Vehicle Categories
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Trucks 1 / Trucks 2 / Non-Trucks Categories
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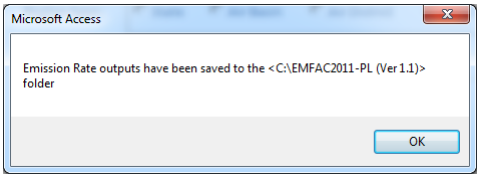
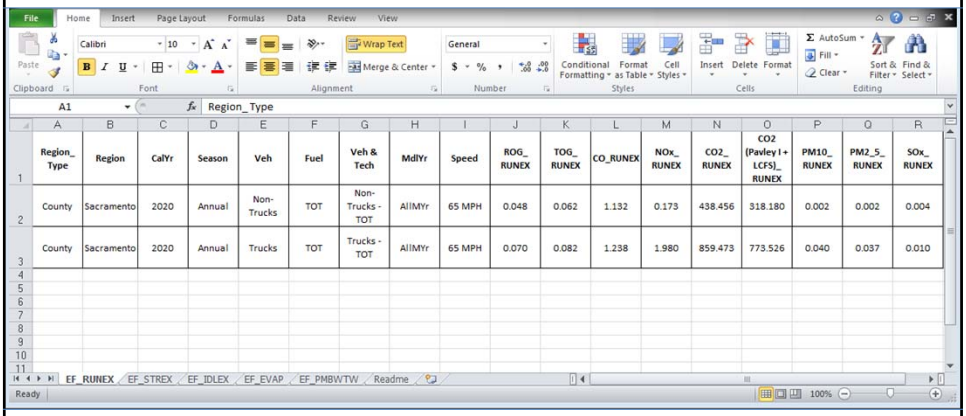
Region type:
State
Air Basin
Air District
MPO
County
GAI
Region
Sacramento
CalYr
2020
Season
Annual
Vehicle Category
ALL
Fuel Type
TOT
Speed
65 MPH
Reset
Download
Click 'Download'

Process Completion Message

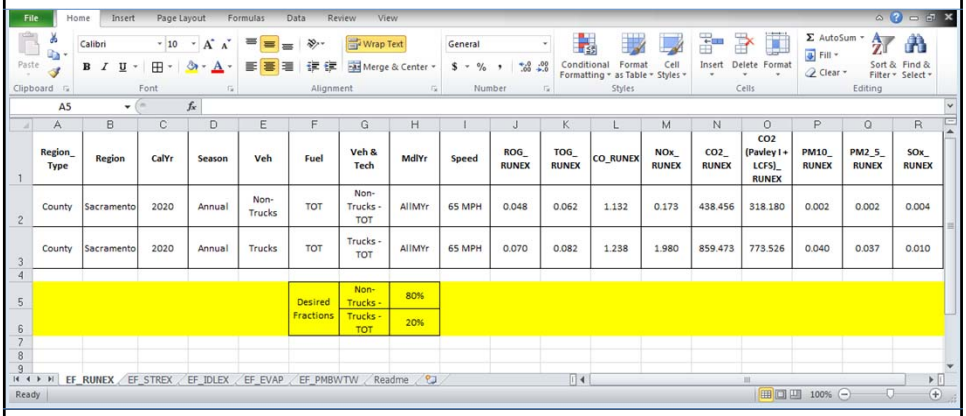


ER: RUNEX - Default Output



Region_ Type	Region	CalYr	Season	Veh	Fuel	Veh & Tech	MdlYr	Speed	ROG_ RUNEX	TOG_ RUNEX	CO_RUNEX	NOx_ RUNEX	CO2_ RUNEX	CO2 (Pavley I + LCFS)_ RUNEX	PM10_ RUNEX	PM2_5_ RUNEX	SOx_ RUNEX
County	Sacramento	2020	Annual	Non-Trucks	TOT	Non-Trucks - TOT	AllMYr	65 MPH	0.048	0.062	1.132	0.173	438.456	318.180	0.002	0.002	0.004
County	Sacramento	2020	Annual	Trucks	TOT	Trucks - TOT	AllMYr	65 MPH	0.070	0.082	1.238	1.980	859.473	773.526	0.040	0.037	0.010

Identify Desired Fractions for Trucks/Non-Trucks



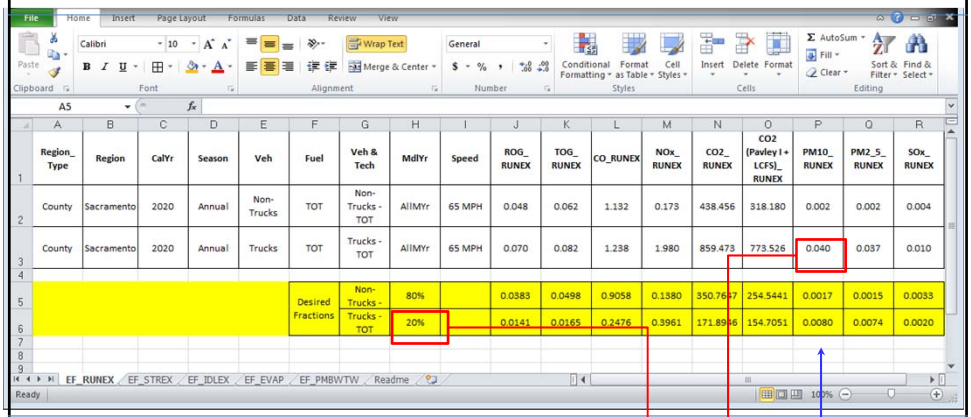
Region_ Type	Region	CalYr	Season	Veh	Fuel	Veh & Tech	MdlYr	Speed	ROG_ RUNEX	TOG_ RUNEX	CO_RUNEX	NOx_ RUNEX	CO2_ RUNEX	CO2 (Pavley I + LCFS)_ RUNEX	PM10_ RUNEX	PM2_5_ RUNEX	SOx_ RUNEX
County	Sacramento	2020	Annual	Non-Trucks	TOT	Non-Trucks - TOT	AllMYr	65 MPH	0.048	0.062	1.132	0.173	438.456	318.180	0.002	0.002	0.004
County	Sacramento	2020	Annual	Trucks	TOT	Trucks - TOT	AllMYr	65 MPH	0.070	0.082	1.238	1.980	859.473	773.526	0.040	0.037	0.010

Desired Fractions	Non-Trucks - TOT	80%
	Trucks - TOT	20%

Calculate ER Components using Desired Fraction

$$\text{ER Component}_{\text{Non-Truck}} = \text{Desired Fraction}_{\text{Non-Truck}} \times \text{Original ER}_{\text{Non-Truck}}$$

$$\text{ER Component}_{\text{Truck}} = \text{Desired Fraction}_{\text{Truck}} \times \text{Original ER}_{\text{Truck}}$$



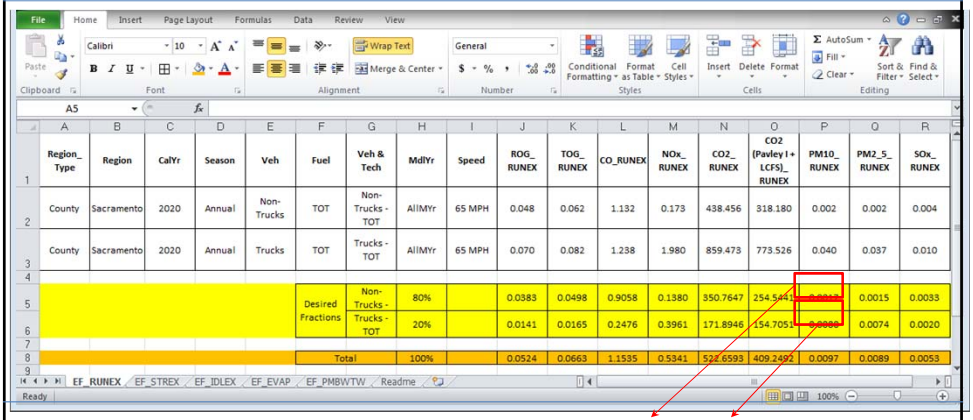
Region_ Type	Region	CalYr	Season	Veh	Fuel	Veh & Tech	MdlYr	Speed	ROG_ RUNEX	TOG_ RUNEX	CO_RUNEX	NOx_ RUNEX	CO2_ RUNEX	CO2 (Pavley I + LCFS)_ RUNEX	PM10_ RUNEX	PM2_5_ RUNEX	SOx_ RUNEX
County	Sacramento	2020	Annual	Non-Trucks	TOT	Non-Trucks - TOT	AllMYr	65 MPH	0.048	0.062	1.132	0.173	438.456	318.180	0.002	0.002	0.004
County	Sacramento	2020	Annual	Trucks	TOT	Trucks - TOT	AllMYr	65 MPH	0.070	0.082	1.238	1.980	859.473	773.526	0.040	0.037	0.010
					Desired Fractions	Non-Trucks - TOT	80%		0.0383	0.0498	0.9058	0.1380	350.7647	254.5441	0.0017	0.0015	0.0033
						Trucks - TOT	20%		0.0141	0.0165	0.2476	0.3961	171.8946	154.7051	0.0080	0.0074	0.0020

For example: $\text{PM10\_RUNEX ER Component}_{\text{Truck}} = 20\% \times 0.040 = 0.0080$

Calculate Resulting Emission Rate

(Repeat procedure for STREX, IDLEX, EVAP, & PMBWTW)

$$ER_{Total} = ER_{Non-Truck} + ER_{Truck}$$



Region_ Type	Region	CalYr	Season	Veh	Fuel	Veh & Tech	MdlYr	Speed	ROG_ RUNEX	TOG_ RUNEX	CO_RUNEX	NOx_ RUNEX	CO2_ RUNEX	CO2 (Pavley I + LCFS)_ RUNEX	PM10_ RUNEX	PM2_5_ RUNEX	SOx_ RUNEX
County	Sacramento	2020	Annual	Non-Trucks	TOT	Non-Trucks - TOT	AllMYr	65 MPH	0.048	0.062	1.132	0.173	438.456	318.180	0.002	0.002	0.004
County	Sacramento	2020	Annual	Trucks	TOT	Trucks - TOT	AllMYr	65 MPH	0.070	0.082	1.238	1.980	859.473	773.526	0.040	0.037	0.010
					Desired Fractions	Non-Trucks -	80%		0.0383	0.0498	0.9058	0.1380	350.7647	254.5441	0.0017	0.0015	0.0033
						Trucks - TOT	20%		0.0141	0.0165	0.2476	0.3961	171.8946	154.7051	0.0080	0.0074	0.0020
					Total		100%		0.0524	0.0663	1.1535	0.5341	522.6593	409.2492	0.0097	0.0089	0.0053

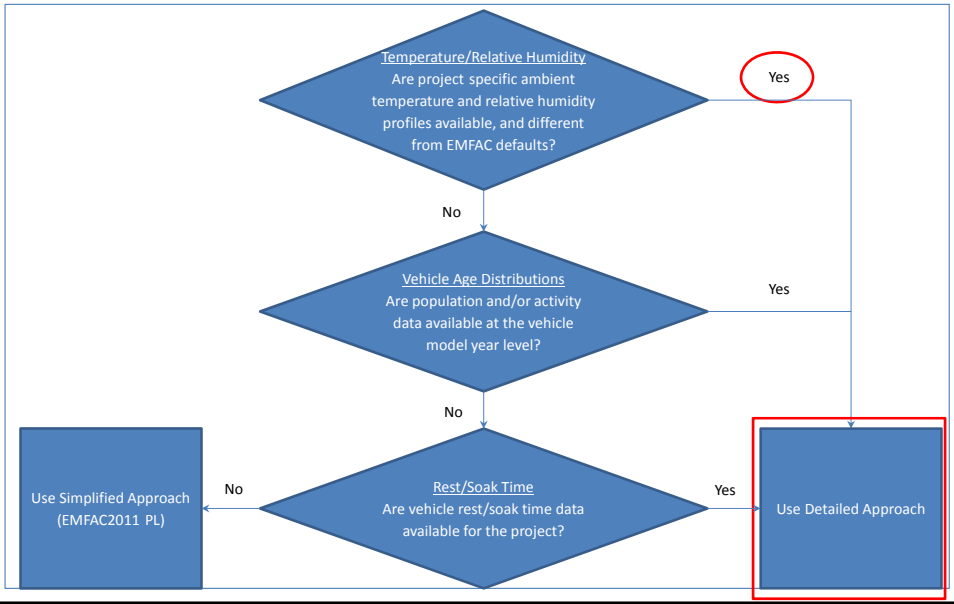
For example: $PM10\_RUNEX\ ER_{Total} = 0.0017 + 0.0080 = 0.0097$

Scenario #5A Urban Bus Idle

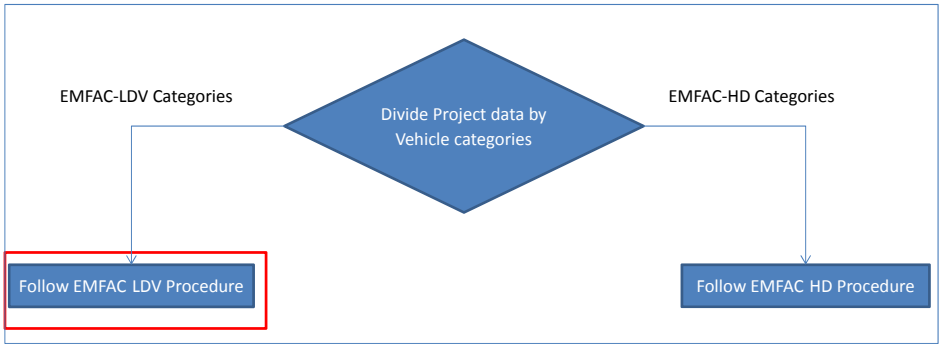
- One scenario for bus-only transit terminal
  - Urban Buses

- To produce idles rates for the Urban Buses at the transit terminal.
- UBUS Idle Emission rates are generated by EMFAC-LDV
- Edit the population so that all population is “Urban Bus (UBUS)”
- Fuel is diesel and age changed to reflect the actual ages of the bus fleet

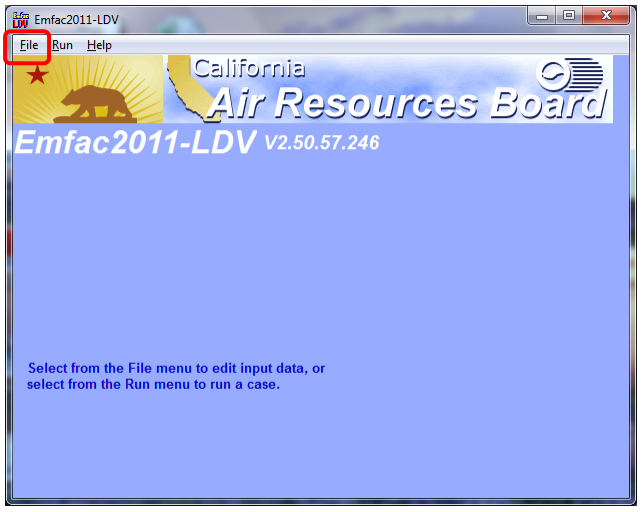
Protocol



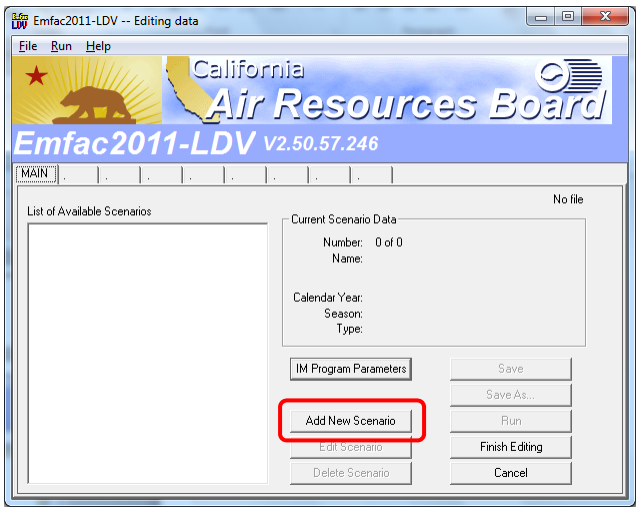
Detailed Approach



Open EMFAC2011-LDV

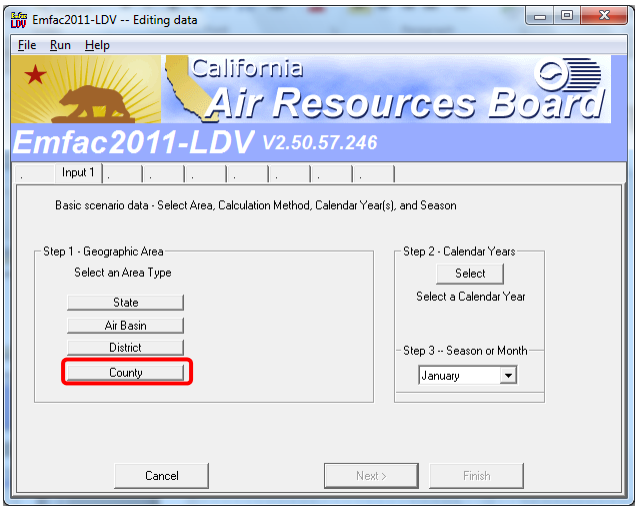


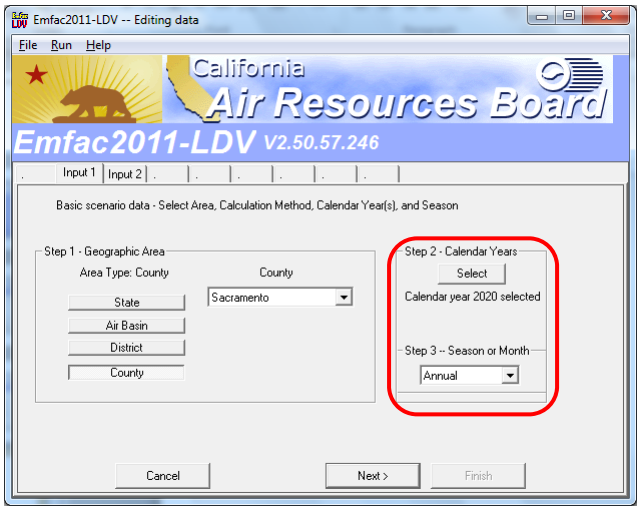
Add New Scenario



Inputs

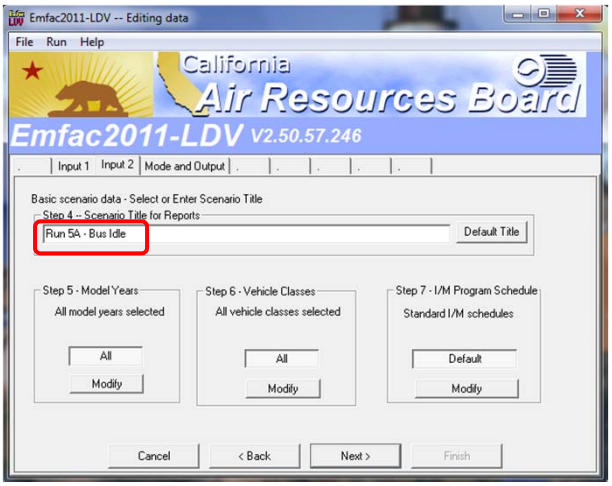
- Step 1 - Select “County”, “Sacramento”
- Step 2 - Select “2020”
- Step 3 - Select “Annual”
- Click “Next”

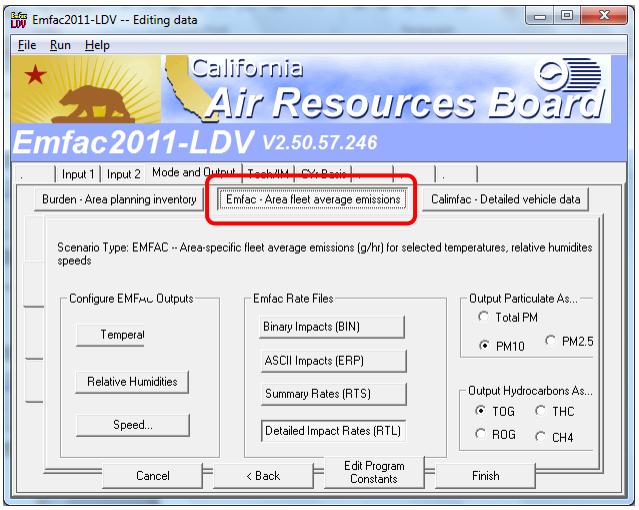


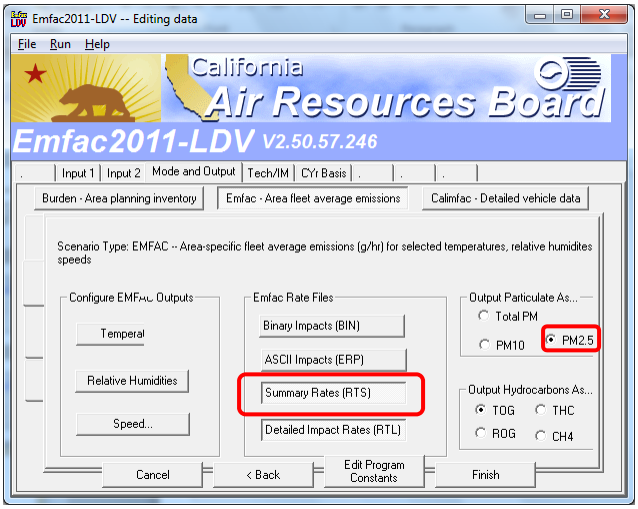


Input 2 Tab

- Step 4 – Select a Scenario Title name
- Then Click “Next”
- Select “Emfac – Area fleet average emissions”
- Click on “Summary Rates (RTS)” and Output Particulate as “PM2.5”; “Detailed Impact Rates (RTL)” will already be selected

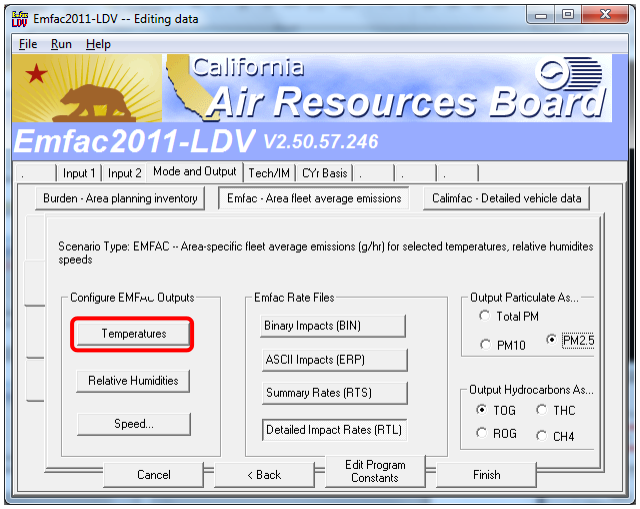

Emfac2011-LDV -- Editing data
File Run Help
California
Air Resources Board
Emfac2011-LDV V2.50.57.246
Input 1 Input 2 Mode and Output
Basic scenario data - Select or Enter Scenario Title
Step 4 -- Scenario Title for Reports
Run 5A - Bus Idle
Default Title
Step 5 - Model Years
All model years selected
All
Modify
Step 6 - Vehicle Classes
All vehicle classes selected
All
Modify
Step 7 - I/M Program Schedule
Standard I/M schedules
Default
Modify
Cancel
< Back
Next >
Finish

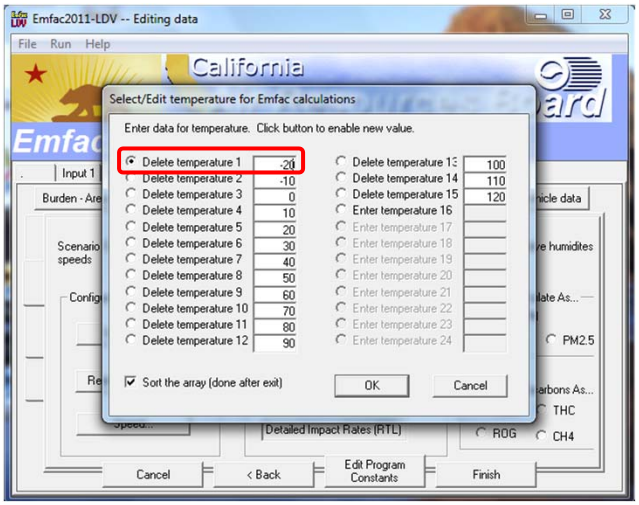

Emfac2011-LDV -- Editing data
File Run Help
California
Air Resources Board
Emfac2011-LDV V2.50.57.246
Input 1 Input 2 Mode and Output
Burden - Area planning inventory
Emfac - Area fleet average emissions
Calimfac - Detailed vehicle data
Scenario Type: EMFAC -- Area-specific fleet average emissions (g/hr) for selected temperatures, relative humidites speeds
Configure EMFAC Outputs
Temperat
Relative Humidities
Speed...
Emfac Rate Files
Binary Impacts (BIN)
ASCII Impacts (ERP)
Summary Rates (RTS)
Detailed Impact Rates (RTL)
Output Particulate As...
Total PM
PM10
PM2.5
Output Hydrocarbons As...
TOG
THC
ROG
CH4
Cancel
< Back
Edit Program Constants
Finish

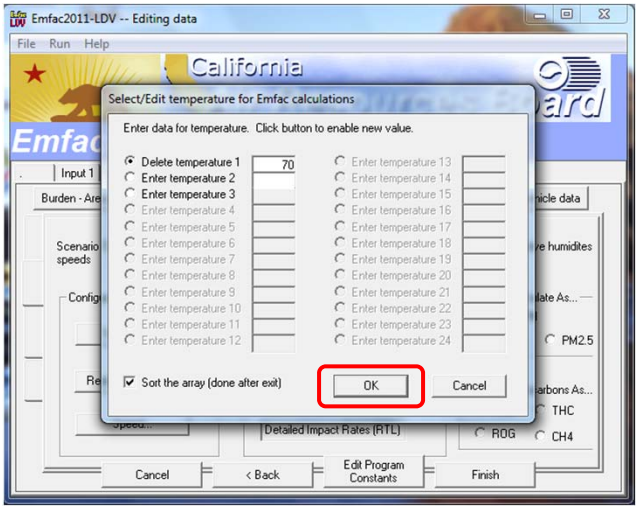


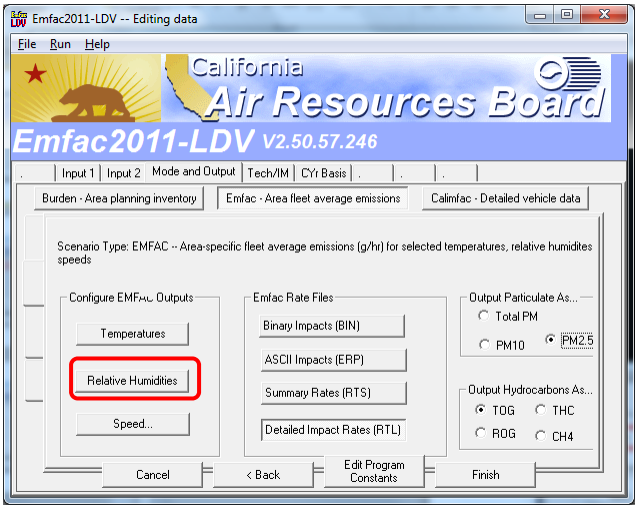
Edit Program Constants

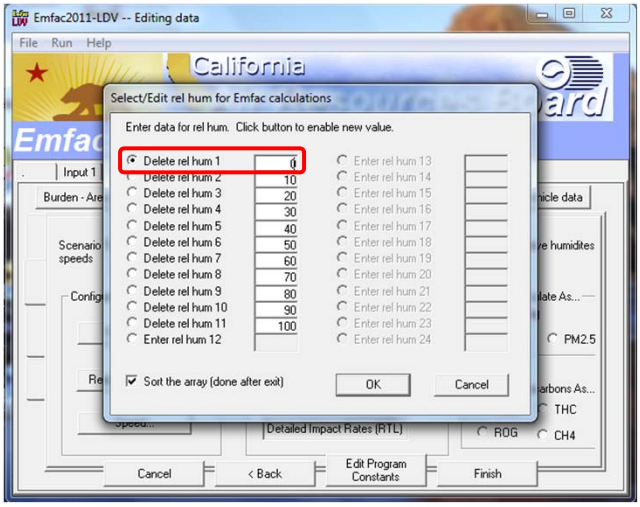
- Select “Temperature”
- Delete all temperatures except 70
- Select “Relative Humidities”
- Delete all except 70
- Click “Finish”

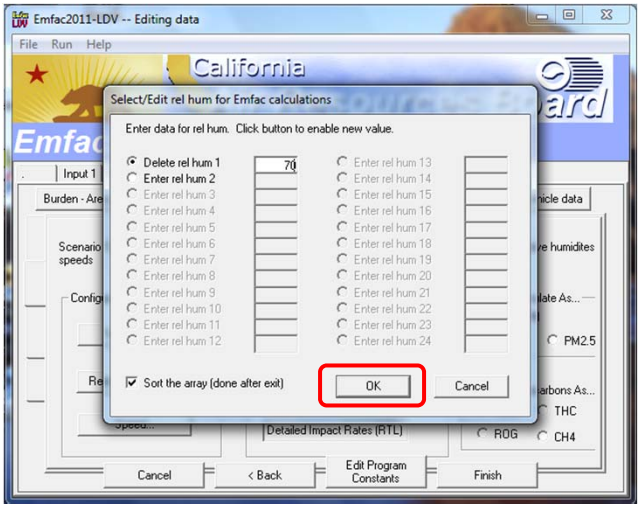

Emfac2011-LDV -- Editing data
File Run Help
California
Air Resources Board
Emfac2011-LDV V2.50.57.246
Input 1 Input 2 Mode and Output Tech/IM CYr Basis
Burden - Area planning inventory
Emfac - Area fleet average emissions
Calimfac - Detailed vehicle data
Scenario Type: EMFAC -- Area-specific fleet average emissions (g/hr) for selected temperatures, relative humidites speeds
Configure EMFAC Outputs
Temperatures
Relative Humidities
Speed...
Emfac Rate Files
Binary Impacts (BIN)
ASCII Impacts (ERP)
Summary Rates (RTS)
Detailed Impact Rates (RTL)
Output Particulate As...
Total PM
PM10
PM2.5
Output Hydrocarbons As...
TOG
THC
ROG
CH4
Cancel
< Back
Edit Program Constants
Finish

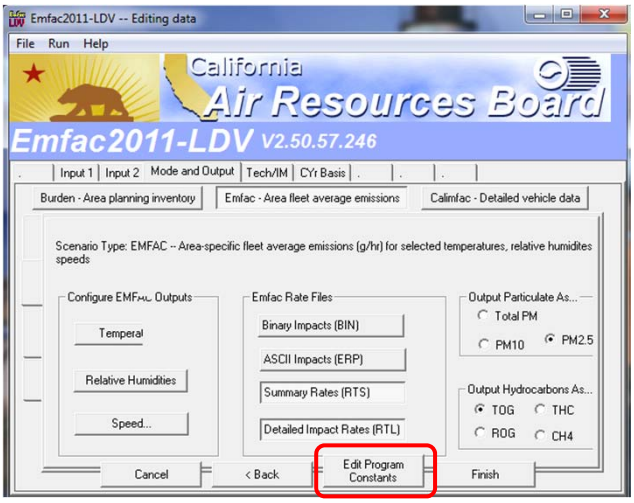

Emfac2011-LDV -- Editing data
File Run Help
California
Select/Edit temperature for Emfac calculations
Enter data for temperature. Click button to enable new value.
Delete temperature 1 -20
Delete temperature 2 -10
Delete temperature 3 0
Delete temperature 4 10
Delete temperature 5 20
Delete temperature 6 30
Delete temperature 7 40
Delete temperature 8 50
Delete temperature 9 60
Delete temperature 10 70
Delete temperature 11 80
Delete temperature 12 90
Delete temperature 13 100
Delete temperature 14 110
Delete temperature 15 120
Enter temperature 16
Enter temperature 17
Enter temperature 18
Enter temperature 19
Enter temperature 20
Enter temperature 21
Enter temperature 22
Enter temperature 23
Enter temperature 24
Sort the array (done after exit)
OK
Cancel
Cancel
< Back
Edit Program Constants
Finish


Emfac2011-LDV -- Editing data
File Run Help
California
Select/Edit temperature for Emfac calculations
Enter data for temperature. Click button to enable new value.
Delete temperature 1
70
Enter temperature 2
Enter temperature 3
Sort the array (done after exit)
OK
Cancel
Detailed Impact Rates (RTL)
Cancel
< Back
Edit Program Constants
Finish

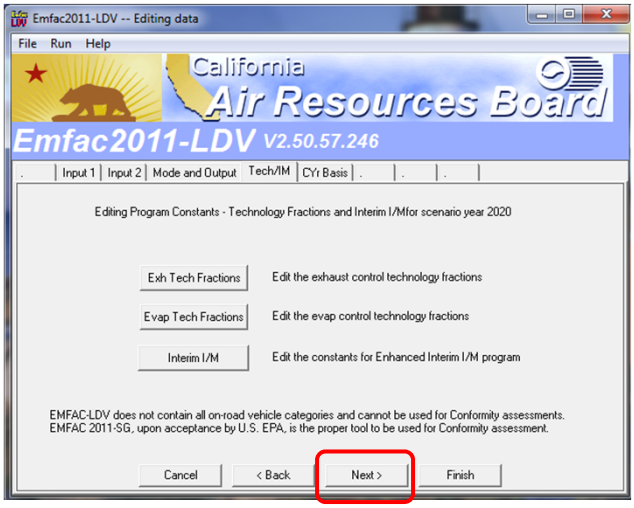

Emfac2011-LDV -- Editing data
File Run Help
California
Air Resources Board
Emfac2011-LDV V2.50.57.246
Input 1 Input 2 Mode and Output Tech/IM CYr Basis
Burden - Area planning inventory
Emfac - Area fleet average emissions
Calimfac - Detailed vehicle data
Scenario Type: EMFAC -- Area-specific fleet average emissions (g/hr) for selected temperatures, relative humidites speeds
Configure EMFAC Outputs
Temperatures
Relative Humidities
Speed...
Emfac Rate Files
Binary Impacts (BIN)
ASCII Impacts (ERP)
Summary Rates (RTS)
Detailed Impact Rates (RTL)
Output Particulate As...
Total PM
PM10
PM2.5
Output Hydrocarbons As...
TOG
THC
ROG
CH4
Cancel
< Back
Edit Program Constants
Finish


Emfac2011-LDV -- Editing data
File Run Help
California
Select/Edit rel hum for Emfac calculations
Enter data for rel hum. Click button to enable new value.
Delete rel hum 1
Delete rel hum 2
Delete rel hum 3
Delete rel hum 4
Delete rel hum 5
Delete rel hum 6
Delete rel hum 7
Delete rel hum 8
Delete rel hum 9
Delete rel hum 10
Delete rel hum 11
Enter rel hum 12
0
10
20
30
40
50
60
70
80
90
100
Enter rel hum 13
Enter rel hum 14
Enter rel hum 15
Enter rel hum 16
Enter rel hum 17
Enter rel hum 18
Enter rel hum 19
Enter rel hum 20
Enter rel hum 21
Enter rel hum 22
Enter rel hum 23
Enter rel hum 24
Sort the array (done after exit)
OK
Cancel
Input 1
Burden - Are
Scenario speeds
Config
Re
Detailed Impact Rates (RTL)
ROG
CH4
THC
PM2.5
Cancel
< Back
Edit Program Constants
Finish

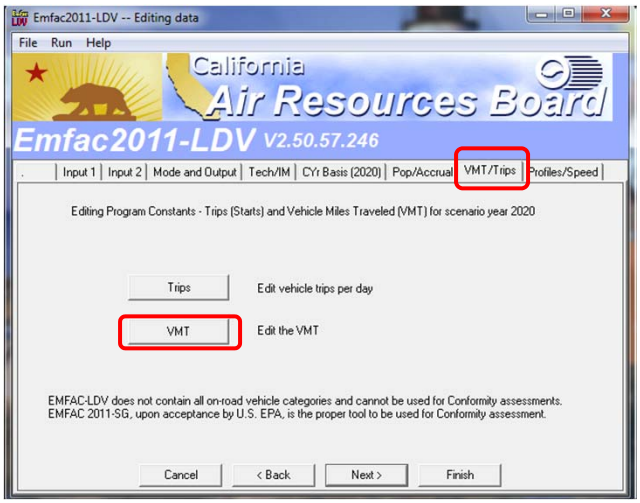

Emfac2011-LDV -- Editing data
File Run Help
California
Select/Edit rel hum for Emfac calculations
Enter data for rel hum. Click button to enable new value.
Delete rel hum 1
Enter rel hum 2
Enter rel hum 3
Enter rel hum 4
Enter rel hum 5
Enter rel hum 6
Enter rel hum 7
Enter rel hum 8
Enter rel hum 9
Enter rel hum 10
Enter rel hum 11
Enter rel hum 12
70
Enter rel hum 13
Enter rel hum 14
Enter rel hum 15
Enter rel hum 16
Enter rel hum 17
Enter rel hum 18
Enter rel hum 19
Enter rel hum 20
Enter rel hum 21
Enter rel hum 22
Enter rel hum 23
Enter rel hum 24
Sort the array (done after exit)
OK
Cancel
Input 1
Burden - Are
Scenario speeds
Config
Re
Detailed Impact Rates (RTL)
ROG
CH4
THC
PM2.5
Cancel
< Back
Edit Program Constants
Finish



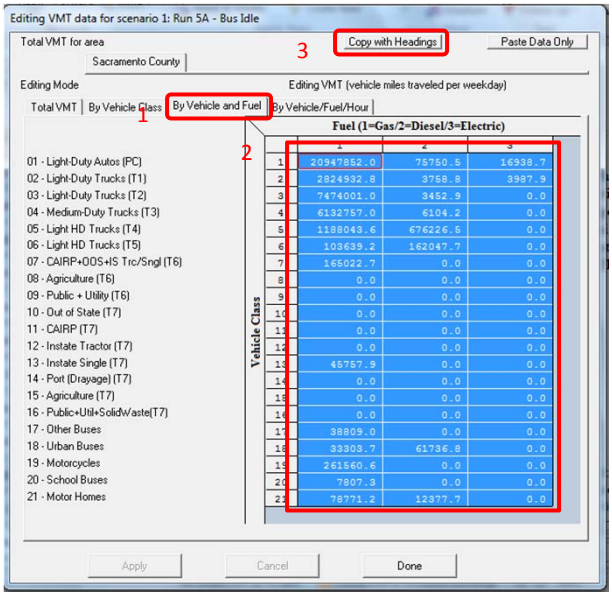
Click Edit Program Constants.



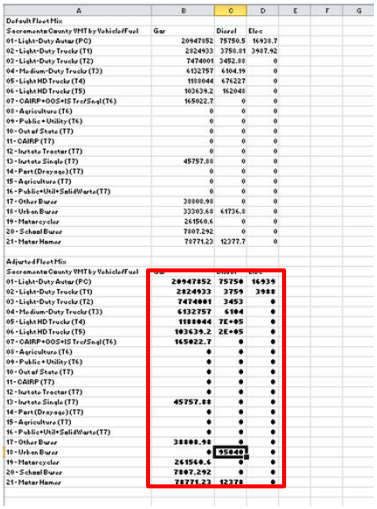
Click Next.



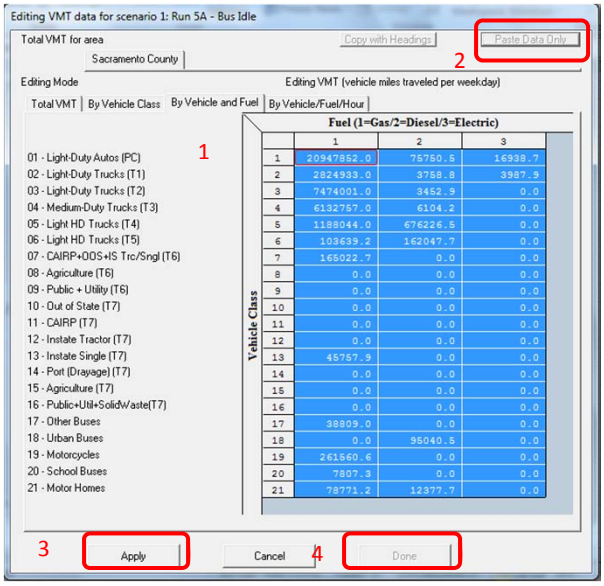
Select the VMT/Trips tab, then click VMT.



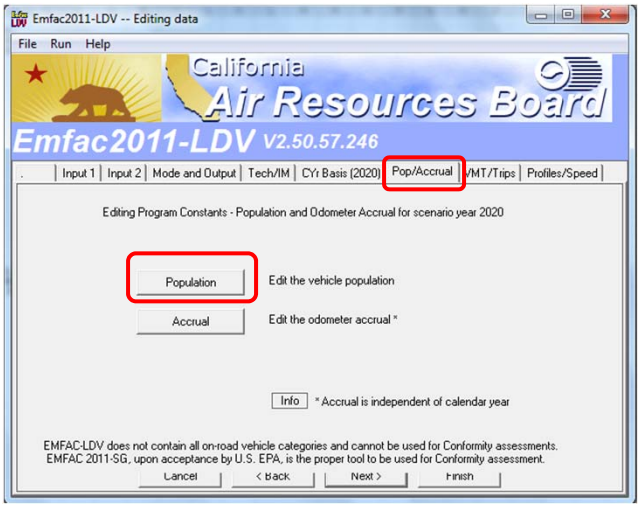
Select By Vehicle and Fuel tab, highlight data, then click Copy with Headings.



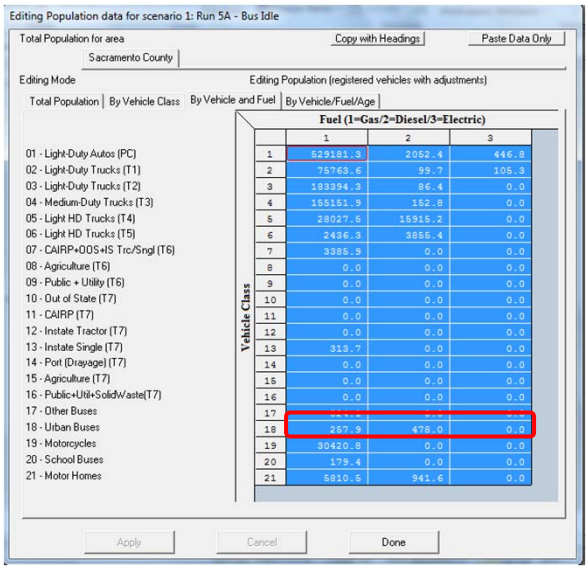
Paste the copied default VMT data in an Excel spreadsheet, then calculate the Adjusted Fleet Mix by entering the project-specific VMT



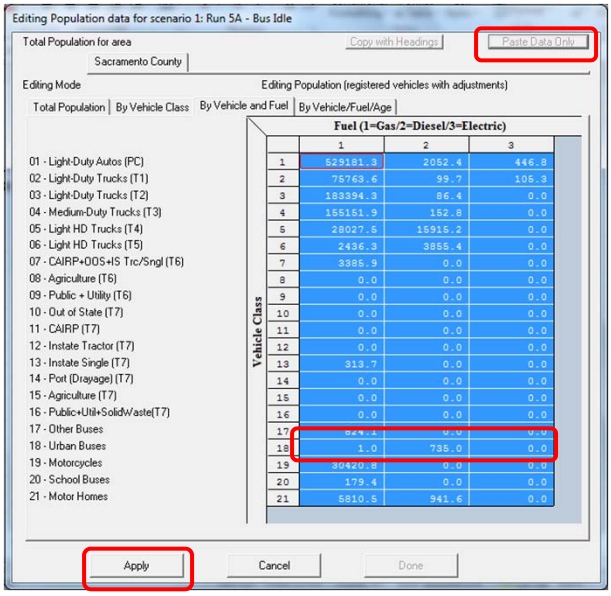
Highlight data, click Paste Data Only, click Apply, then click Done.



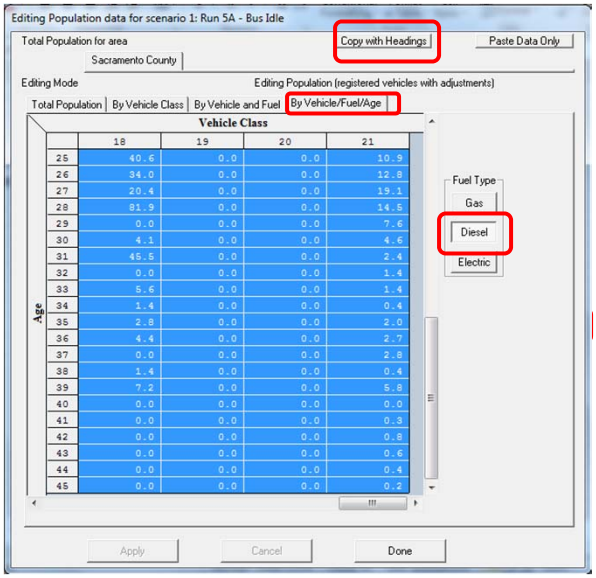
Select Pop/Accrual tab, then click Population.



Change Urban bus population so all buses are diesel.



Enter 735 under diesel and 1 under gas (EMFAC does not allowing editing to 0). Click apply then the By Vehicle Fuel/Age tab.



Click Diesel, highlight all cells, then select Copy with Headings.

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R
1	Sacramento County Diesel Population by Vehicle/Age	Age01	Age02	Age03	Age04	Age05	Age06	Age07	Age08	Age09	Age10	Age11	Age12	Age13	Age14	Age15	Age16	Age17
2	01 - Light-Duty Autos (PC)	107.392	116.6921	120.7175	125.414	124.654	132.578	136.194	151.164	148.801	159.664	160.98	91.1089	4.2179	0	0	0	0
3	02 - Light-Duty Trucks (T1)	5.89883	6.753723	6.189529	5.94551	8.31762	6.75504	6.90862	7.19441	5.67421	7.13976	5.01213	0	0	0	0	0	0
4	03 - Light-Duty Trucks (T2)	3.69323	3.339813	5.727913	8.52275	6.42886	4.85719	8.93835	10.1227	5.52699	4.36661	6.10023	0	0	0	5.39637	5.76233	0
5	04 - Medium-Duty Trucks (T3)	6.04514	7.137085	8.096372	8.49153	8.84578	7.65178	6.84921	7.69306	6.89387	6.53202	5.25401	39.7149	3.23242	3.23413	2.35691	0	1.42842
6	05 - Light HD Trucks (T4)	846.242	830.4297	838.2295	767.343	741.755	682.981	644.825	596.572	531.949	484.042	413.208	98.0636	424.307	501.718	1072.55	878.398	1055.52
7	06 - Light HD Trucks (T5)	221.771	217.8745	205.5427	167.542	179.308	161.234	147.646	145.887	136.469	114.874	95.8857	45.9858	217.437	201.629	346.241	272.905	147.709
8	07 - CAIRP-OOS-IS TrcrSngl (T6)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9	08 - Agriculture (T6)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10	09 - Public + Utility (T6)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11	10 - Out of State (T7)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12	11 - CAIRP (T7)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
13	12 - Instate Tractor (T7)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
14	13 - Instate Single (T7)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
15	14 - Port (Drayage) (T7)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
16	15 - Agriculture (T7)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
17	16 - Public+Util+SolidWaste(T7)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
18	17 - Other Buses	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
19	18 - Urban Buses	0	45	165	22.5	7.5	15	187.5	82.5	67.5	30	0	90	7.5	7.5	7.5	0	0
20	19 - Motorcycles	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
21	20 - School Buses	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
22	21 - Motor Homes	41.9127	37.03845	36.30701	33.6259	32.7575	29.8086	27.6451	24.692	20.7957	18.1059	17.6014	8.00818	40.7134	52.2736	62.872	51.7242	57.2

	age	count	fraction of tota	adjusted count
1	1	0	0	0
2	2	6	0.06122449	45
3	3	22	0.224489796	165
4	4	3	0.030612245	22.5
5	5	1	0.010204082	7.5
6	6	2	0.020408163	15
7	7	25	0.255102041	187.5
8	8	11	0.112244898	82.5
9	9	9	0.091836735	67.5
10	10	4	0.040816327	30
11	11	0	0	0
12	12	12	0.12244898	90
13	13	1	0.010204082	7.5
14	14	1	0.010204082	7.5
15	15	1	0.010204082	7.5
16				
17	total urban buses (default)		735	

Revise age distribution for Urban Buses using bus roster data in an Excel worksheet.

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R
1	Sacramento County Diesel Population by Vehicle/Age	Age01	Age02	Age03	Age04	Age05	Age06	Age07	Age08	Age09	Age10	Age11	Age12	Age13	Age14	Age15	Age16	Age17
2	01 - Light-Duty Autos (PC)	107.392	116.6921	120.7175	125.414	124.654	132.578	136.194	151.164	148.801	159.664	160.98	91.1089	4.2179	0	0	0	
3	02 - Light-Duty Trucks (T1)	5.89883	6.753723	6.189529	5.94551	8.31762	6.75504	6.90862	7.19441	5.67421	7.13976	5.01213	0	0	0	0	0	
4	03 - Light-Duty Trucks (T2)	3.69323	3.339813	5.727913	8.52275	6.42886	4.85719	8.93835	10.1227	5.52699	4.36661	6.10023	0	0	0	5.39637	5.76233	
5	04 - Medium-Duty Trucks (T3)	6.04514	7.137085	8.096372	8.49153	8.84578	7.65178	6.84921	7.69306	6.89387	6.53202	5.25401	39.7149	3.23242	3.23413	2.35691	0	1.4284
6	05 - Light HD Trucks (T4)	846.242	830.4297	838.2295	767.343	741.755	682.981	644.825	596.572	531.949	484.042	413.208	98.0636	424.307	501.718	1072.55	878.398	1055.5
7	06 - Light HD Trucks (T5)	221.771	217.8745	205.5427	167.542	179.308	161.234	147.646	145.887	136.469	114.874	95.8857	45.9858	217.437	201.629	346.241	272.905	147.70
8	07 - CAIRP-OOS-IS TrcrSngl (T6)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
9	08 - Agriculture (T6)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
10	09 - Public + Utility (T6)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
11	10 - Out of State (T7)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
12	11 - CAIRP (T7)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
13	12 - Instate Tractor (T7)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
14	13 - Instate Single (T7)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
15	14 - Port (Drayage) (T7)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
16	15 - Agriculture (T7)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
17	16 - Public+Util+SolidWaste(T7)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
18	17 - Other Buses	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
19	18 - Urban Buses	0	45	165	22.5	7.5	15	187.5	82.5	67.5	30	0	90	7.5	7.5	7.5	0	
20	19 - Motorcycles	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
21	20 - School Buses	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
22	21 - Motor Homes	41.9127	37.03845	36.30701	33.6259	32.7575	29.8086	27.6451	24.692	20.7957	18.1059	17.6014	8.00818	40.7134	52.2736	62.872	51.7242	57.

	age	count	fraction of tota	adjusted count
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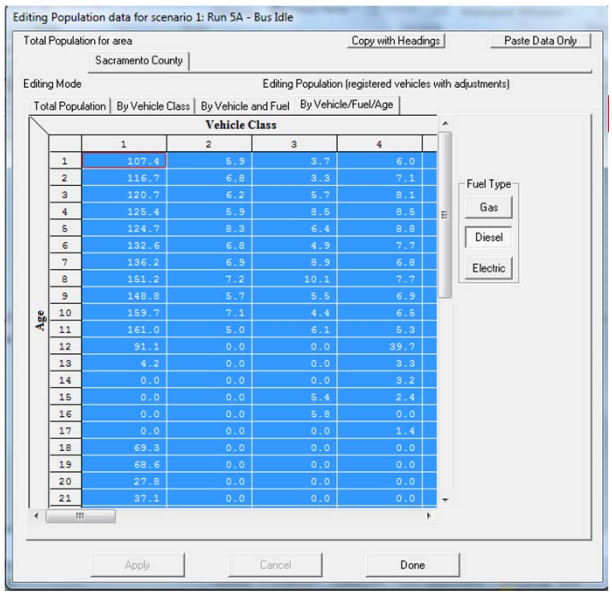
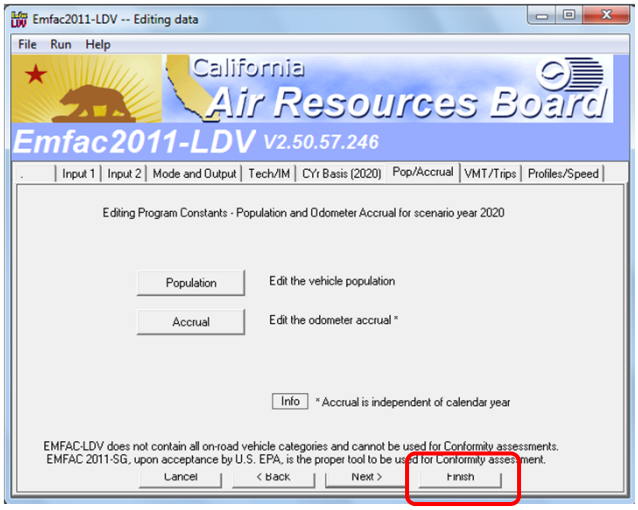
6	6	2	0.020408163	15
7	7	25	0.255102041	187.5
8	8	11	0.112244898	82.5
9	9	9	0.091836735	67.5
10	10	4	0.040816327	30
11	11	0	0	0
12	12	12	0.12244898	90
13	13	1	0.010204082	7.5
14	14	1	0.010204082	7.5
15	15	1	0.010204082	7.5
16				
17	total urban buses (default)		735	

Run1-onroadBusAgeDistribution | Run2-Highway LD-HD | Run3-IdleBusFuelUse | Run3-IdleBusAge

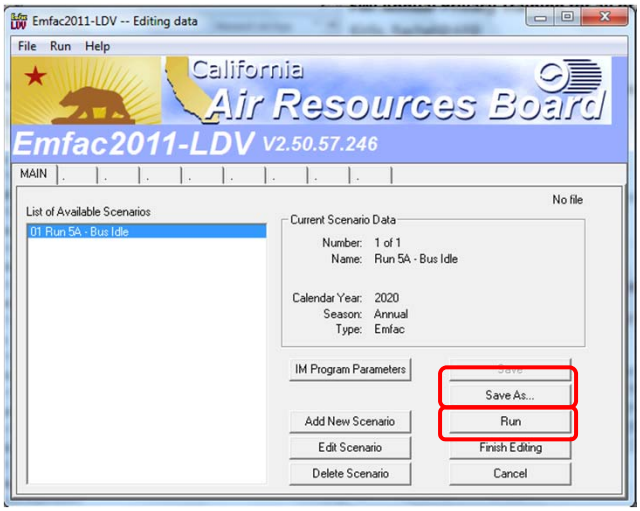
Copy adjusted data from Excel worksheet to EMFAC.



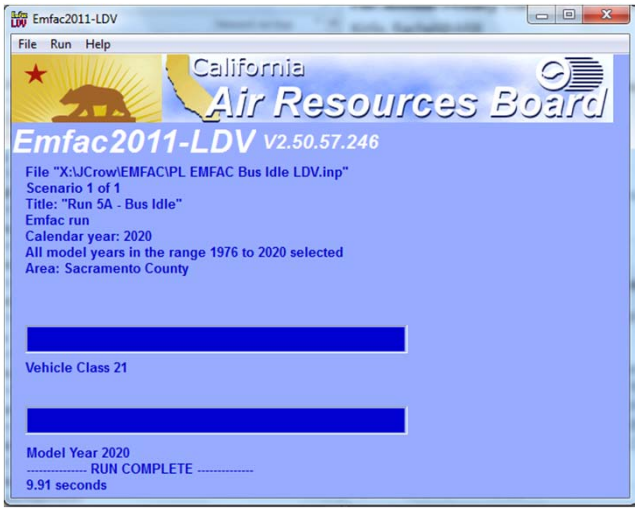
Paste adjusted data, click Apply, then click Done.



Click Finish.



Save file and click Run.



PL EMFAC Bus Idle LDV.rts - Notepad

File Edit Format View Help

```
Title    : Run 5A - Bus Idle
Version  : Emfac2011-LDV V2.50.57.246 ** WIS Enabled **
Run Date : 2012/05/22 13:32:05
Scen Year: 2020 -- All model years in the range 1976 to 2020 selected
Season   : Annual
Area     : Sacramento
*******************************************************************************
     Year: 2020 -- Model Years 1976 to 2020 Inclusive -- Annual
     Emfac2011-LDV Emission Factors: V2.50.57.246 ** WIS Enabled **

     County Average                          Sacramento                County Average

                              Table   1:  Running Exhaust Emissions (grams/mile; grams/idle-

     Pollutant Name: Total Organic Gases       Temperature:  70F  Relative Humidity:  70%

     Speed
      MPH       LDA       LDT       MDT       HDT       UBUS      MCY       ALL

        0       0.000     0.000     3.932    17.925     0.000     0.000     0.961
        5       0.118     0.179     0.360     1.140     0.100     5.062     0.224
       10       0.077     0.118     0.244     0.741     0.072     3.839     0.152
       15       0.053     0.082     0.173     0.500     0.054     3.064     0.109
       20       0.039     0.060     0.129     0.353     0.042     2.572     0.082
       25       0.030     0.046     0.101     0.264     0.034     2.270     0.065
```

Open rts file in Notepad.

Since UBUS emission rates for Speed 0 MPH [idling] are 0, the 5 MPH Running Emission Rate (g/mile) is converted to Idling Emission Rate (g/hr)

PL EMFAC Bus Idle LDV.rts - Notepad

File Edit Format View Help

```
     Pollutant Name: PM2.5                     Temperature:  70F  Relative Humidity:  70%

     Speed
      MPH       LDA       LDT       MDT       HDT       UBUS      MCY       ALL

        0       0.000     0.000     0.077     0.000     0.000     0.000     0.016
        5       0.008     0.010     0.016     0.020     0.097     0.001     0.011
       10       0.005     0.006     0.012     0.014     0.071     0.000     0.007
       15       0.004     0.004     0.009     0.009     0.053     0.000     0.005
       20       0.003     0.003     0.007     0.007     0.041     0.000     0.004
       25       0.002     0.002     0.006     0.006     0.033     0.000     0.003
       30       0.002     0.002     0.005     0.005     0.028     0.000     0.002
       35       0.001     0.002     0.004     0.005     0.024     0.000     0.002
       40       0.001     0.001     0.004     0.004     0.021     0.000     0.002
       45       0.001     0.001     0.003     0.005     0.020     0.000     0.002
       50       0.001     0.001     0.003     0.005     0.019     0.000     0.002
       55       0.001     0.001     0.003     0.006     0.019     0.000     0.002
       60       0.001     0.002     0.003     0.007     0.020     0.000     0.002
       65       0.002     0.002     0.003     0.008     0.021     0.001     0.002
```

Select the UBUS running emissions for PM2.5 at 5 MPH

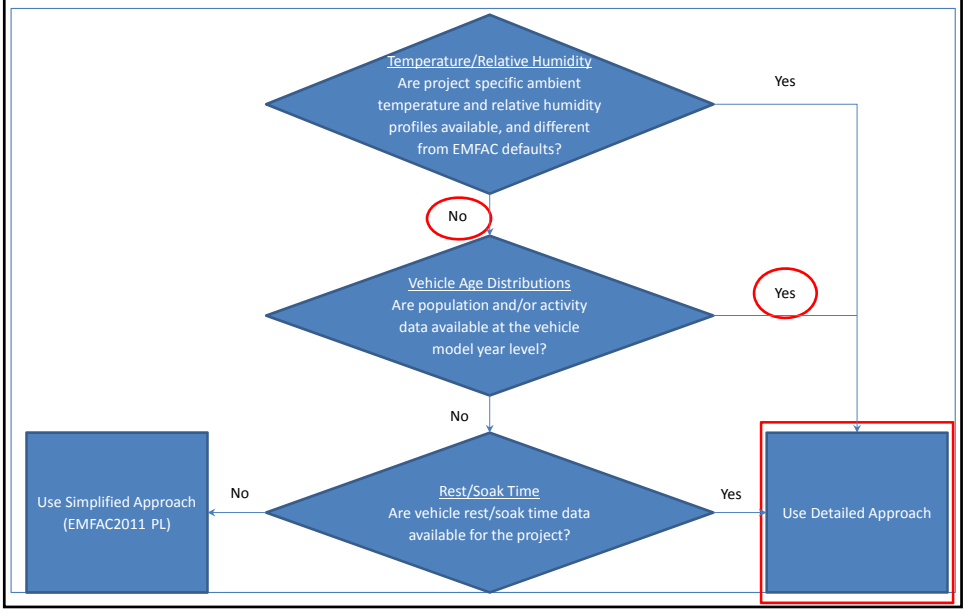
- Multiply the 5 MPH Emission rate (g/mile) by 5 (mile/hr) to calculate the Idling Emission rate (g/hr)

Scenario #5B Other Bus - DSL Idle

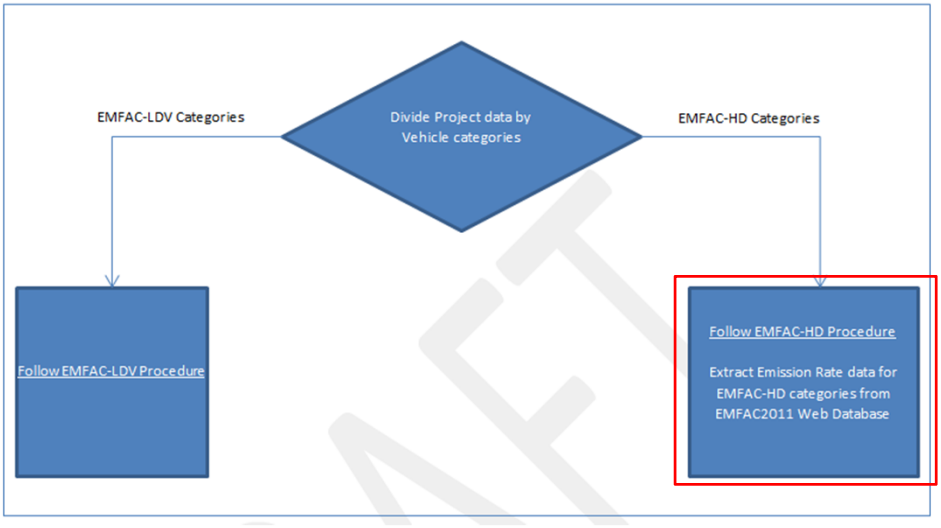
- One scenario for bus-only transit terminal
  - Other Buses - DSL

- To produce idles rates for the Other Buses at the transit terminal.
- OBUS - DSL Idle Emission rates are generated by EMFAC-HD
- Fuel is diesel and age changed to reflect the actual ages of the bus fleet

Protocol

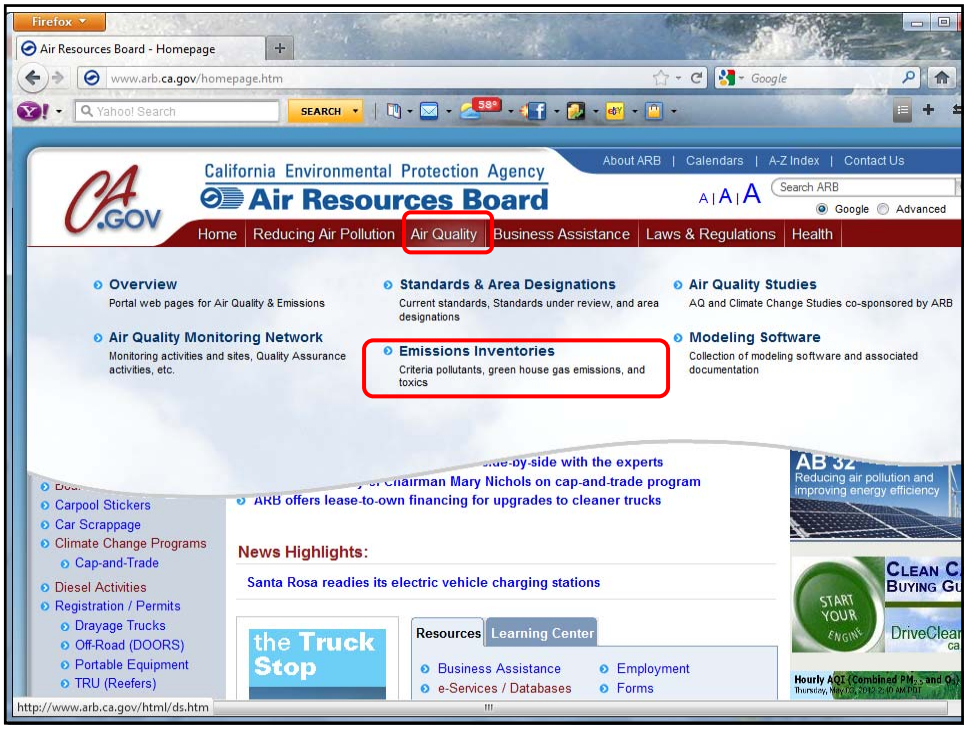


Detailed Approach



Procedure

- From the ARB website, select the “Air Quality” tab,
- Then select “Emissions Inventories”
- Then select “Mobile”
- Then select “On-Road Motor Vehicles”
- Then select “EMFAC 2011 Idling Emission Rates”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California Environmental Protection Agency
Air Resources Board
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Overview
Portal web pages for Air Quality & Emissions
Standards & Area Designations
Current standards, Standards under review, and area designations
Air Quality Studies
AQ and Climate Change Studies co-sponsored by ARB
Air Quality Monitoring Network
Monitoring activities and sites, Quality Assurance activities, etc.
Emissions Inventories
Criteria pollutants, green house gas emissions, and toxics
Modeling Software
Collection of modeling software and associated documentation
Carpool Stickers
Car Scrappage
Climate Change Programs
Cap-and-Trade
Diesel Activities
Registration / Permits
Drayage Trucks
Off-Road (DOORS)
Portable Equipment
TRU (Reefers)
ARB offers lease-to-own financing for upgrades to cleaner trucks
News Highlights:
Santa Rosa readies its electric vehicle charging stations
the Truck Stop
Resources
Learning Center
Business Assistance
Employment
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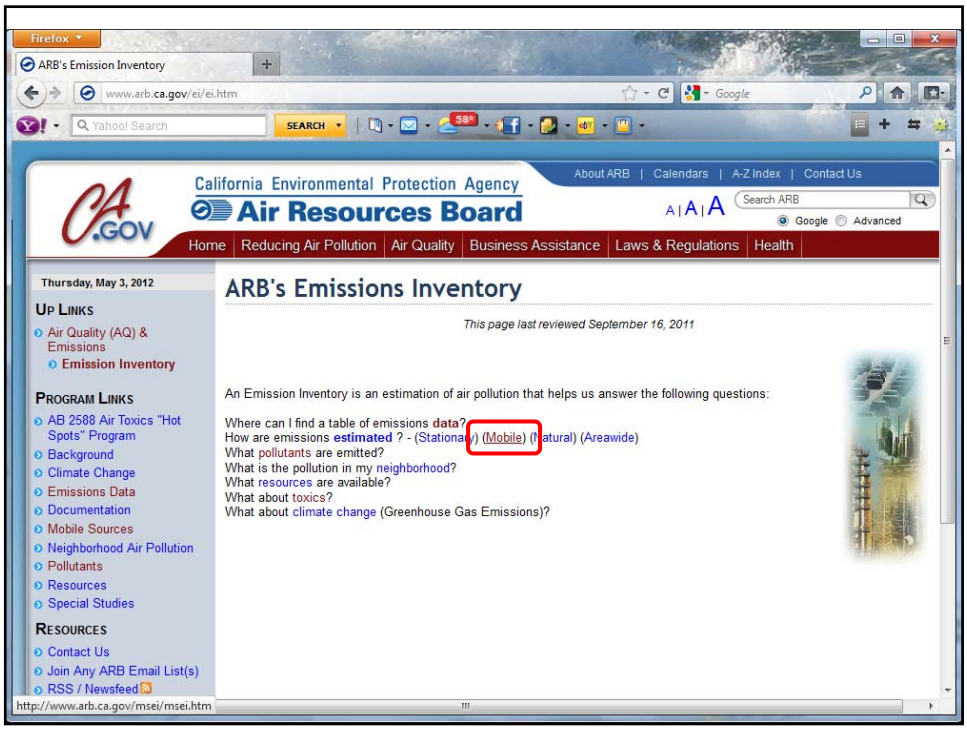
Forms
AB 32
Reducing air pollution and improving energy efficiency
http://www.arb.ca.gov/html/ds.htm


ARB's Emission Inventory
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AB 2588 Air Toxics "Hot Spots" Program
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Climate Change
Emissions Data
Documentation
Mobile Sources
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Pollutants
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Special Studies
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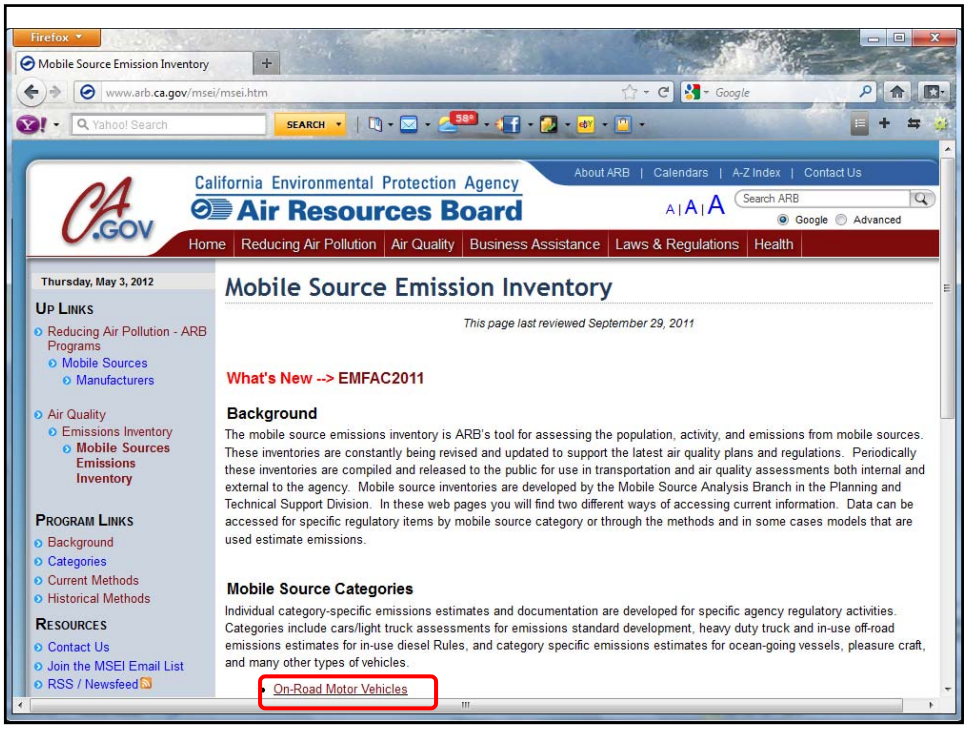
ARB's Emissions Inventory
This page last reviewed September 16, 2011
An Emission Inventory is an estimation of air pollution that helps us answer the following questions:
Where can I find a table of emissions data?
How are emissions estimated ? - (Stationary) (Mobile) (Natural) (Areawide)
What pollutants are emitted?
What is the pollution in my neighborhood?
What resources are available?
What about toxics?
What about climate change (Greenhouse Gas Emissions)?
http://www.arb.ca.gov/msei/msei.htm


Mobile Source Emission Inventory
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Air Quality
Emissions Inventory
Mobile Sources Emissions Inventory
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Categories
Current Methods
Historical Methods
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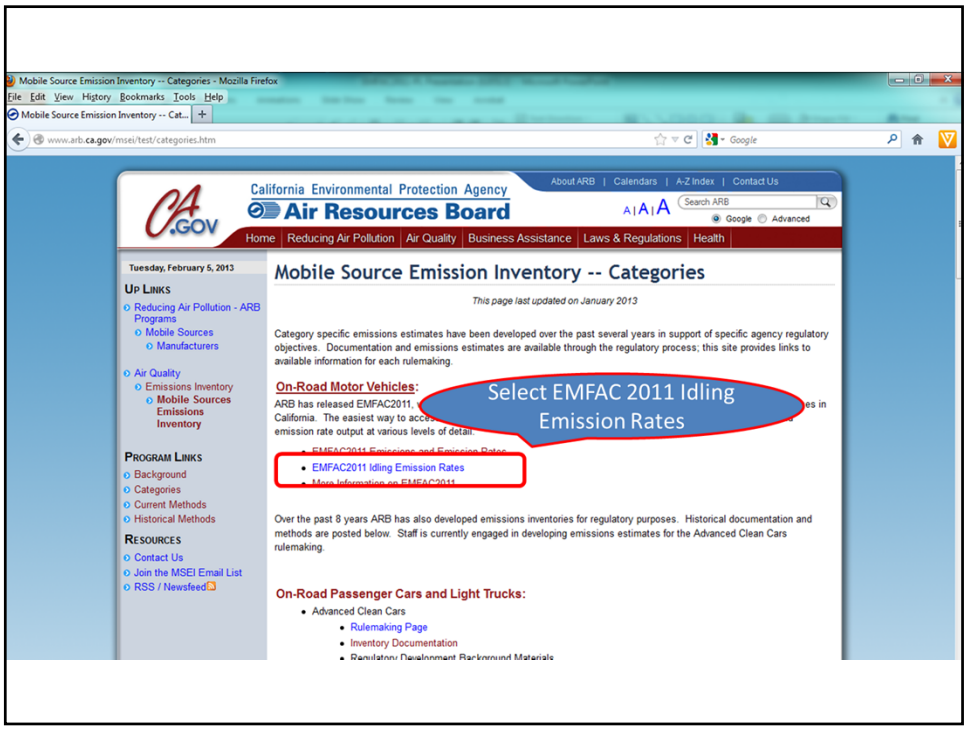
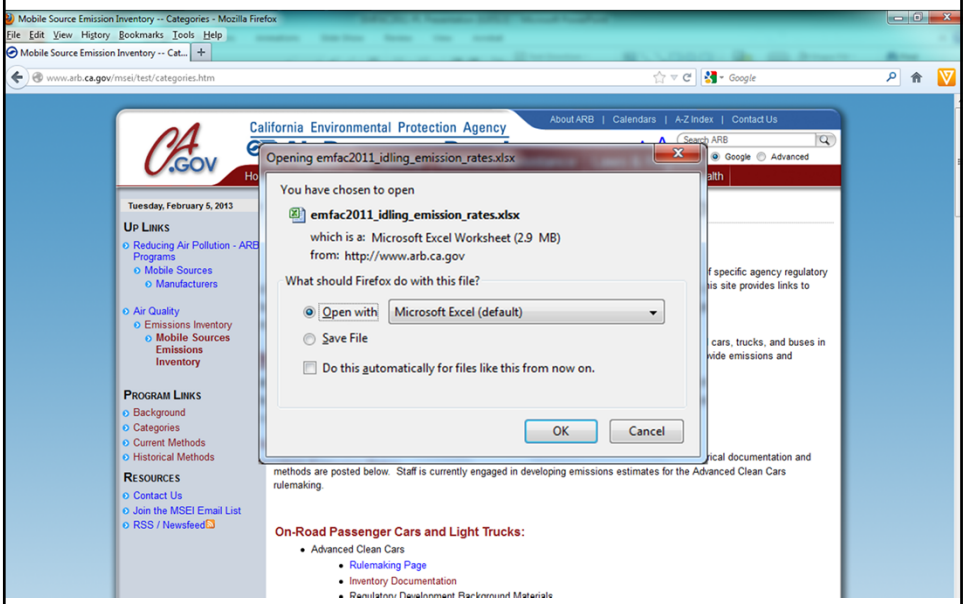
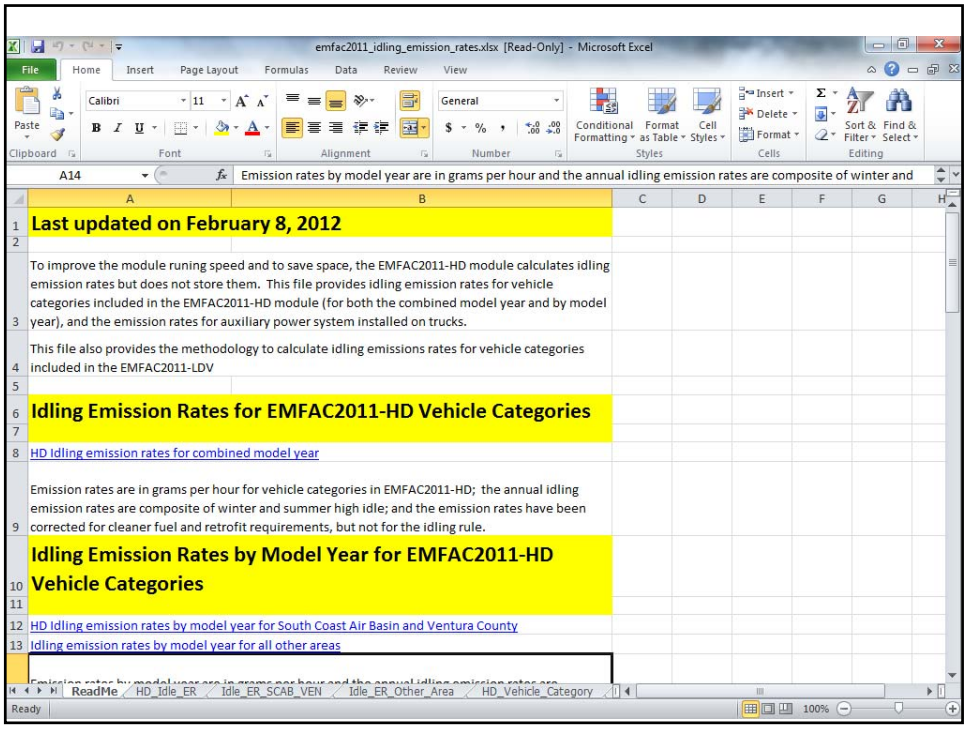
Mobile Source Emission Inventory
This page last reviewed September 29, 2011
What's New --> EMFAC2011
Background
The mobile source emissions inventory is ARB's tool for assessing the population, activity, and emissions from mobile sources. These inventories are constantly being revised and updated to support the latest air quality plans and regulations. Periodically these inventories are compiled and released to the public for use in transportation and air quality assessments both internal and external to the agency. Mobile source inventories are developed by the Mobile Source Analysis Branch in the Planning and Technical Support Division. In these web pages you will find two different ways of accessing current information. Data can be accessed for specific regulatory items by mobile source category or through the methods and in some cases models that are used estimate emissions.
Mobile Source Categories
Individual category-specific emissions estimates and documentation are developed for specific agency regulatory activities. Categories include cars/light truck assessments for emissions standard development, heavy duty truck and in-use off-road emissions estimates for in-use diesel Rules, and category specific emissions estimates for ocean-going vessels, pleasure craft, and many other types of vehicles.
On-Road Motor Vehicles

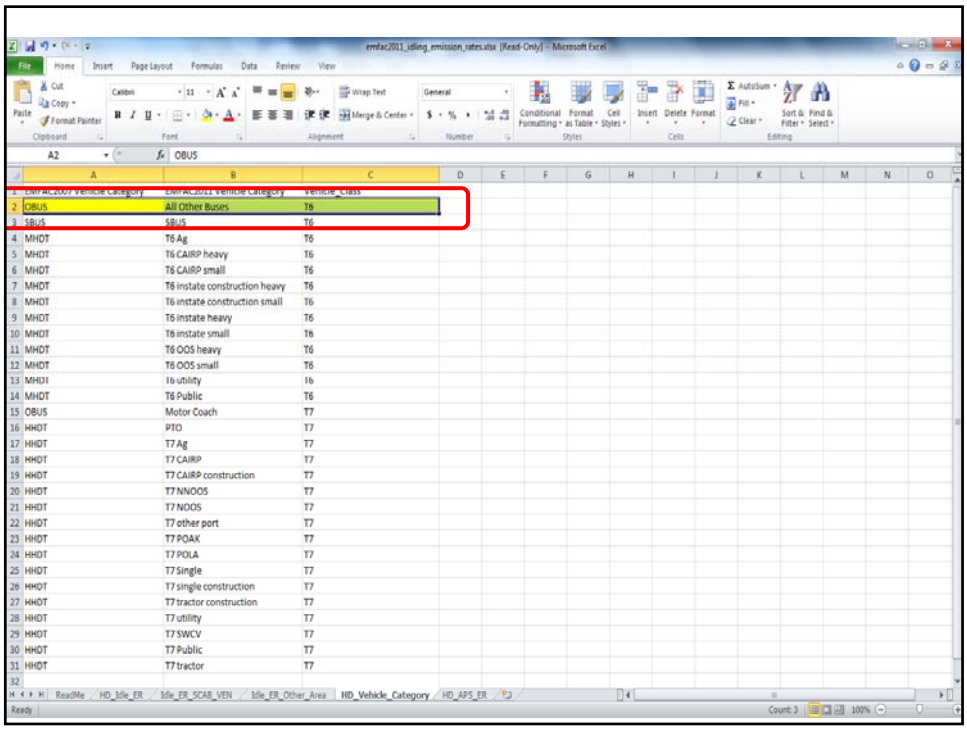

Mobile Source Emission Inventory -- Categories - Mozilla Firefox
www.arb.ca.gov/msei/test/categories.htm
California Environmental Protection Agency
Air Resources Board
Home | Reducing Air Pollution | Air Quality | Business Assistance | Laws & Regulations | Health
Tuesday, February 5, 2013
Mobile Source Emission Inventory -- Categories
This page last updated on January 2013
Category specific emissions estimates have been developed over the past several years in support of specific agency regulatory objectives. Documentation and emissions estimates are available through the regulatory process; this site provides links to available information for each rulemaking.
On-Road Motor Vehicles:
Select EMFAC 2011 Idling Emission Rates
EMFAC2011 Idling Emission Rates
Over the past 8 years ARB has also developed emissions inventories for regulatory purposes. Historical documentation and methods are posted below. Staff is currently engaged in developing emissions estimates for the Advanced Clean Cars rulemaking.
On-Road Passenger Cars and Light Trucks:
Advanced Clean Cars
Rulemaking Page
Inventory Documentation

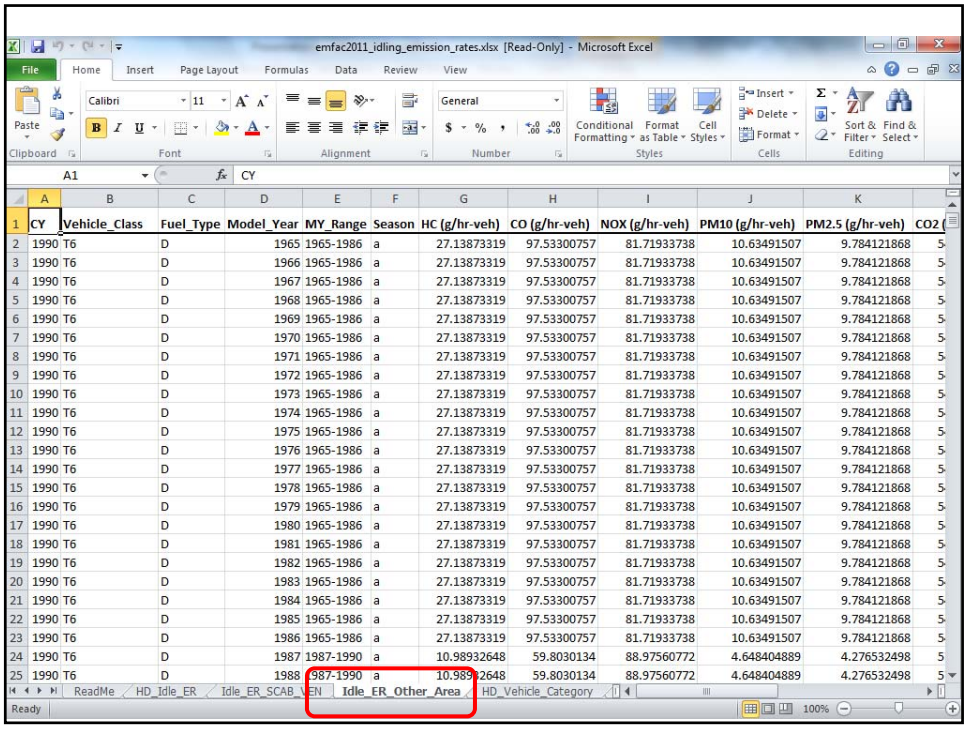


Using the Idling Emission Rates

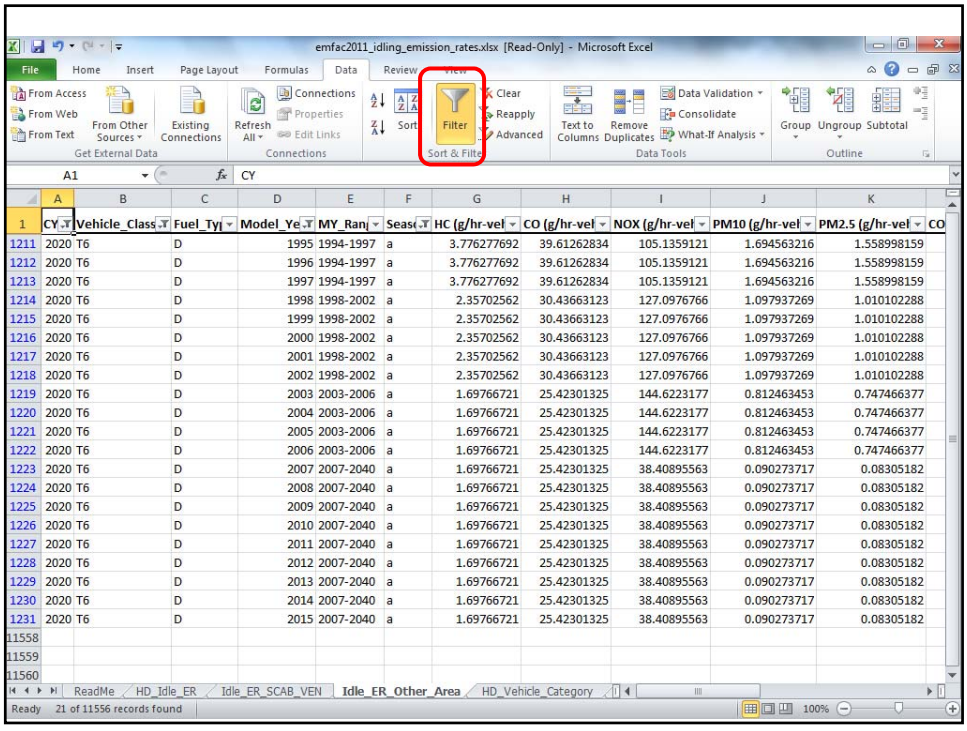
- Click on the “Idle_ER_Other_Area” Tab
- From the “Data” menu, select the “Filter” function
- Select the following from the drop-down menus:
  - Select “2020” for Calendar Year
  - Identify the Vehicle Class that corresponds to OBUS from the ‘HD_Vehicle_Category’ table (T6)
  - Select “T6” for Vehicle Class
  - Select “D” Diesel for Fuel Type
  - Select all years from 1995-2015 for Model Year
  - Select “a” (Annual) for Season


emfac2011_idling_emission_rates.xlsx [Read-Only] - Microsoft Excel
A14
Emission rates by model year are in grams per hour and the annual idling emission rates are composite of winter and
Last updated on February 8, 2012
To improve the module runing speed and to save space, the EMFAC2011-HD module calculates idling emission rates but does not store them. This file provides idling emission rates for vehicle categories included in the EMFAC2011-HD module (for both the combined model year and by model year), and the emission rates for auxiliary power system installed on trucks.
This file also provides the methodology to calculate idling emissions rates for vehicle categories included in the EMFAC2011-LDV
Idling Emission Rates for EMFAC2011-HD Vehicle Categories
HD Idling emission rates for combined model year
Emission rates are in grams per hour for vehicle categories in EMFAC2011-HD; the annual idling emission rates are composite of winter and summer high idle; and the emission rates have been corrected for cleaner fuel and retrofit requirements, but not for the idling rule.
Idling Emission Rates by Model Year for EMFAC2011-HD Vehicle Categories
HD Idling emission rates by model year for South Coast Air Basin and Ventura County
Idling emission rates by model year for all other areas
ReadMe
HD_Idle_ER
Idle_ER_SCAB_VEN
Idle_ER_Other_Area
HD_Vehicle_Category
Ready
100%

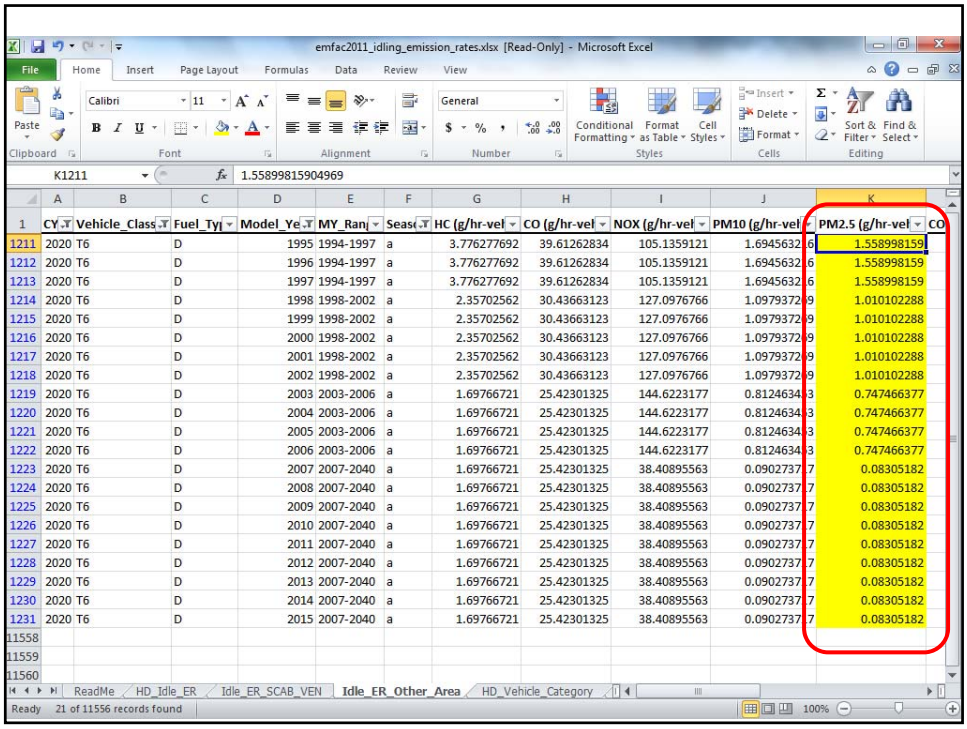

A2
OBUS
OBUS All Other Buses T6
SBUS SBUS T6
MHDT T6 Ag T6
MHDT T6 CAIRP heavy T6
MHDT T6 CAIRP small T6
MHDT T6 instate construction heavy T6
MHDT T6 instate construction small T6
MHDT T6 instate heavy T6
MHDT T6 instate small T6
MHDT T6 OOS heavy T6
MHDT T6 OOS small T6
MHDT T6 utility T6
MHDT T6 Public T6
OBUS Motor Coach T7
HHDT PTO T7
HHDT T7 Ag T7
HHDT T7 CAIRP T7
HHDT T7 CAIRP construction T7
HHDT T7 NNOOS T7
HHDT T7 NOOS T7
HHDT T7 other port T7
HHDT T7 POAK T7
HHDT T7 POLA T7
HHDT T7 Single T7
HHDT T7 single construction T7
HHDT T7 tractor construction T7
HHDT T7 utility T7
HHDT T7 SWCV T7
HHDT T7 Public T7
HHDT T7 tractor T7
ReadMe
HD_Idle_ER
Idle_ER_SCAB_VEN
Idle_ER_Other_Area
HD_Vehicle_Category
HD_APS_ER
Ready



	A	B	C	D	E	F	G	H	I	J	K
1	CY	Vehicle_Class	Fuel_Type	Model_Year	MY_Range	Season	HC (g/hr-veh)	CO (g/hr-veh)	NOX (g/hr-veh)	PM10 (g/hr-veh)	PM2.5 (g/hr-veh)
2	1990	T6	D	1965	1965-1986	a	27.13873319	97.53300757	81.71933738	10.63491507	9.784121868
3	1990	T6	D	1966	1965-1986	a	27.13873319	97.53300757	81.71933738	10.63491507	9.784121868
4	1990	T6	D	1967	1965-1986	a	27.13873319	97.53300757	81.71933738	10.63491507	9.784121868
5	1990	T6	D	1968	1965-1986	a	27.13873319	97.53300757	81.71933738	10.63491507	9.784121868
6	1990	T6	D	1969	1965-1986	a	27.13873319	97.53300757	81.71933738	10.63491507	9.784121868
7	1990	T6	D	1970	1965-1986	a	27.13873319	97.53300757	81.71933738	10.63491507	9.784121868
8	1990	T6	D	1971	1965-1986	a	27.13873319	97.53300757	81.71933738	10.63491507	9.784121868
9	1990	T6	D	1972	1965-1986	a	27.13873319	97.53300757	81.71933738	10.63491507	9.784121868
10	1990	T6	D	1973	1965-1986	a	27.13873319	97.53300757	81.71933738	10.63491507	9.784121868
11	1990	T6	D	1974	1965-1986	a	27.13873319	97.53300757	81.71933738	10.63491507	9.784121868
12	1990	T6	D	1975	1965-1986	a	27.13873319	97.53300757	81.71933738	10.63491507	9.784121868
13	1990	T6	D	1976	1965-1986	a	27.13873319	97.53300757	81.71933738	10.63491507	9.784121868
14	1990	T6	D	1977	1965-1986	a	27.13873319	97.53300757	81.71933738	10.63491507	9.784121868
15	1990	T6	D	1978	1965-1986	a	27.13873319	97.53300757	81.71933738	10.63491507	9.784121868
16	1990	T6	D	1979	1965-1986	a	27.13873319	97.53300757	81.71933738	10.63491507	9.784121868
17	1990	T6	D	1980	1965-1986	a	27.13873319	97.53300757	81.71933738	10.63491507	9.784121868
18	1990	T6	D	1981	1965-1986	a	27.13873319	97.53300757	81.71933738	10.63491507	9.784121868
19	1990	T6	D	1982	1965-1986	a	27.13873319	97.53300757	81.71933738	10.63491507	9.784121868
20	1990	T6	D	1983	1965-1986	a	27.13873319	97.53300757	81.71933738	10.63491507	9.784121868
21	1990	T6	D	1984	1965-1986	a	27.13873319	97.53300757	81.71933738	10.63491507	9.784121868
22	1990	T6	D	1985	1965-1986	a	27.13873319	97.53300757	81.71933738	10.63491507	9.784121868
23	1990	T6	D	1986	1965-1986	a	27.13873319	97.53300757	81.71933738	10.63491507	9.784121868
24	1990	T6	D	1987	1987-1990	a	10.98932648	59.8030134	88.97560772	4.648404889	4.276532498
25	1990	T6	D	1988	1987-1990	a	10.98932648	59.8030134	88.97560772	4.648404889	4.276532498



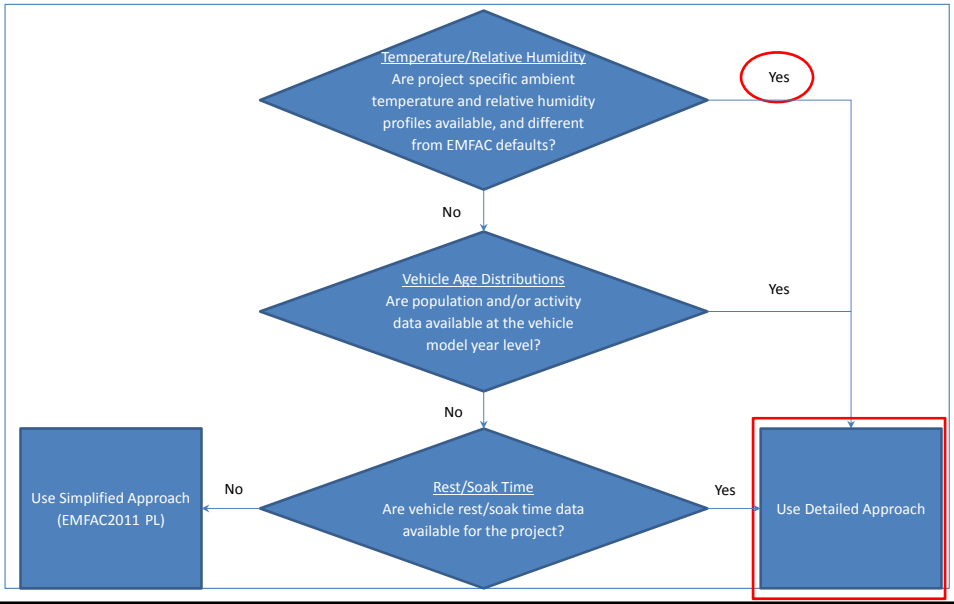
	A	B	C	D	E	F	G	H	I	J	K
1	CY	Vehicle_Class	Fuel_Ty	Model_Ye	MY_Ran	Seas	HC (g/hr-vel	CO (g/hr-vel	NOX (g/hr-vel	PM10 (g/hr-vel	PM2.5 (g/hr-vel
1211	2020	T6	D	1995	1994-1997	a	3.776277692	39.61262834	105.1359121	1.694563216	1.558998159
1212	2020	T6	D	1996	1994-1997	a	3.776277692	39.61262834	105.1359121	1.694563216	1.558998159
1213	2020	T6	D	1997	1994-1997	a	3.776277692	39.61262834	105.1359121	1.694563216	1.558998159
1214	2020	T6	D	1998	1998-2002	a	2.35702562	30.43663123	127.0976766	1.097937269	1.010102288
1215	2020	T6	D	1999	1998-2002	a	2.35702562	30.43663123	127.0976766	1.097937269	1.010102288
1216	2020	T6	D	2000	1998-2002	a	2.35702562	30.43663123	127.0976766	1.097937269	1.010102288
1217	2020	T6	D	2001	1998-2002	a	2.35702562	30.43663123	127.0976766	1.097937269	1.010102288
1218	2020	T6	D	2002	1998-2002	a	2.35702562	30.43663123	127.0976766	1.097937269	1.010102288
1219	2020	T6	D	2003	2003-2006	a	1.69766721	25.42301325	144.6223177	0.812463453	0.747466377
1220	2020	T6	D	2004	2003-2006	a	1.69766721	25.42301325	144.6223177	0.812463453	0.747466377
1221	2020	T6	D	2005	2003-2006	a	1.69766721	25.42301325	144.6223177	0.812463453	0.747466377
1222	2020	T6	D	2006	2003-2006	a	1.69766721	25.42301325	144.6223177	0.812463453	0.747466377
1223	2020	T6	D	2007	2007-2040	a	1.69766721	25.42301325	38.40895563	0.090273717	0.08305182
1224	2020	T6	D	2008	2007-2040	a	1.69766721	25.42301325	38.40895563	0.090273717	0.08305182
1225	2020	T6	D	2009	2007-2040	a	1.69766721	25.42301325	38.40895563	0.090273717	0.08305182
1226	2020	T6	D	2010	2007-2040	a	1.69766721	25.42301325	38.40895563	0.090273717	0.08305182
1227	2020	T6	D	2011	2007-2040	a	1.69766721	25.42301325	38.40895563	0.090273717	0.08305182
1228	2020	T6	D	2012	2007-2040	a	1.69766721	25.42301325	38.40895563	0.090273717	0.08305182
1229	2020	T6	D	2013	2007-2040	a	1.69766721	25.42301325	38.40895563	0.090273717	0.08305182
1230	2020	T6	D	2014	2007-2040	a	1.69766721	25.42301325	38.40895563	0.090273717	0.08305182
1231	2020	T6	D	2015	2007-2040	a	1.69766721	25.42301325	38.40895563	0.090273717	0.08305182
11558											
11559											
11560											



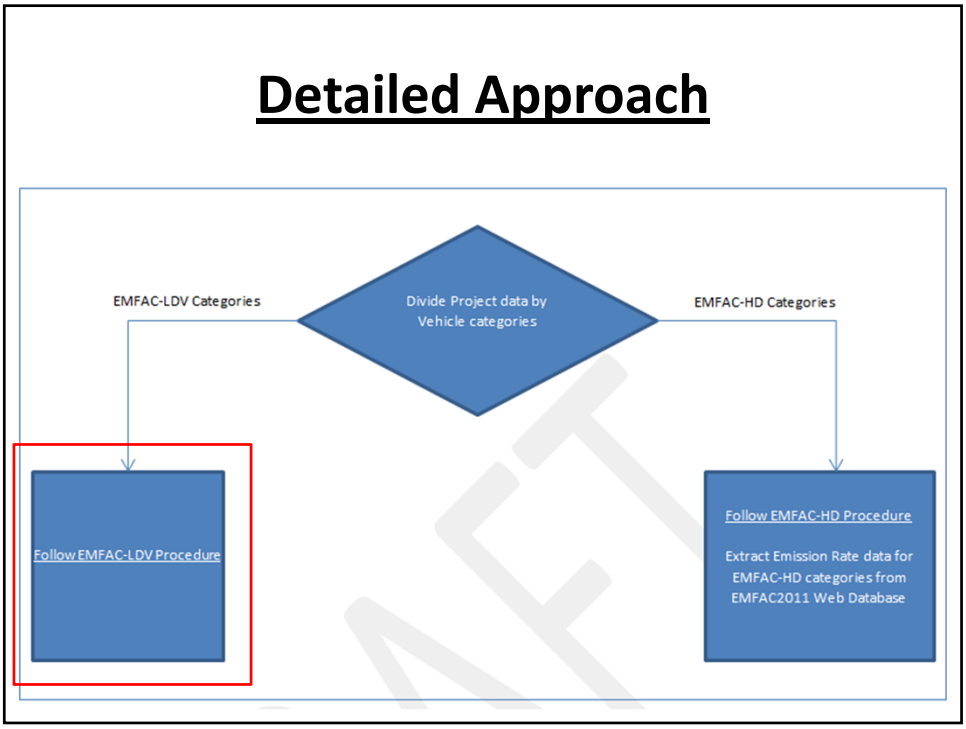
Scenario #6: Parking Lot Fleet Mix

- One scenario for starts (light duty passenger cars and trucks only – default EMFAC mix)
- This is to produce the aggregate start rates for light duty vehicles in the park-n-ride lot.
- Population edited to be only light duty vehicles.
- Generates emission rates for soak at 5, 360 and 720 minutes

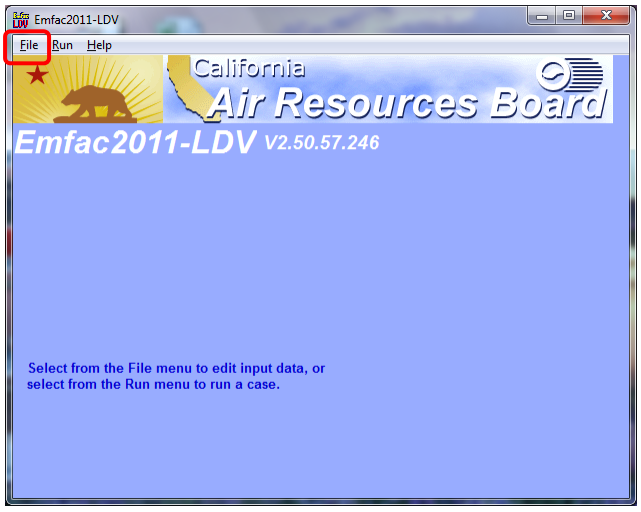
Protocol



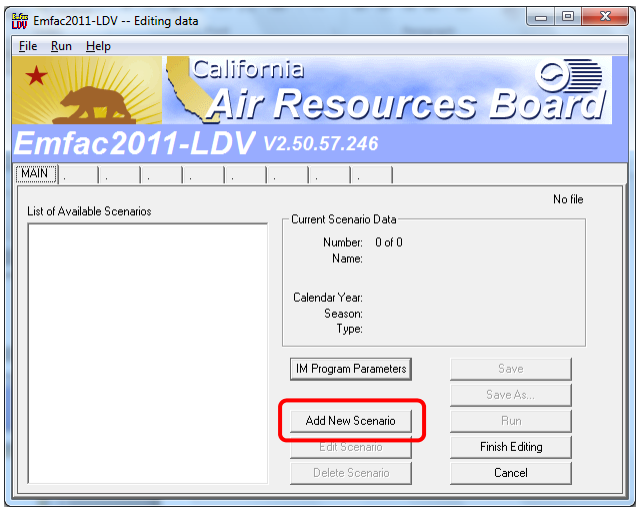
Detailed Approach



Open EMFAC2011-LDV

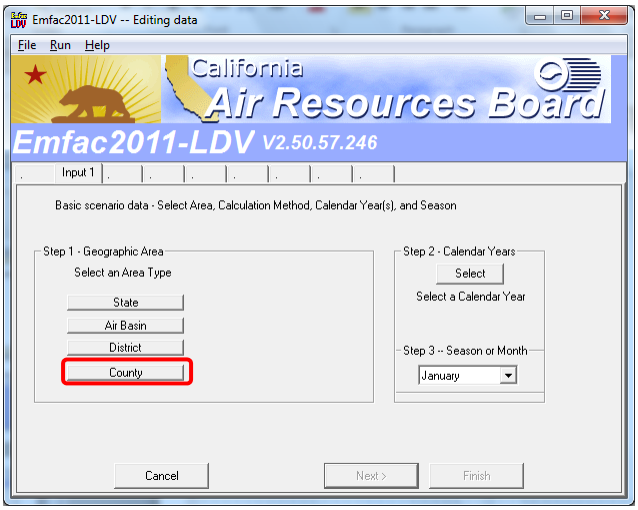


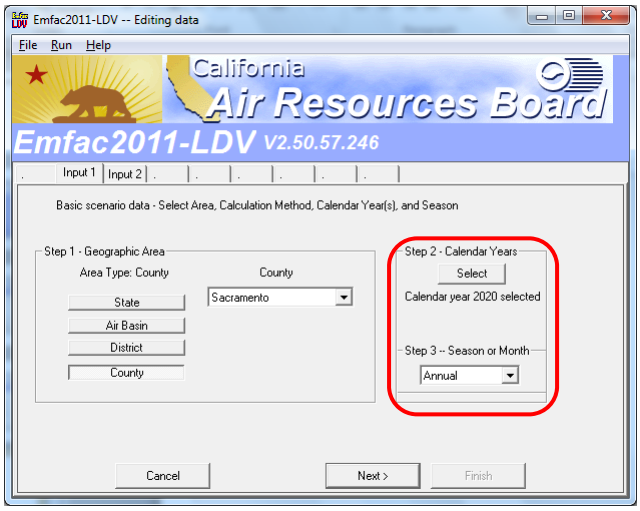
Add New Scenario



Inputs

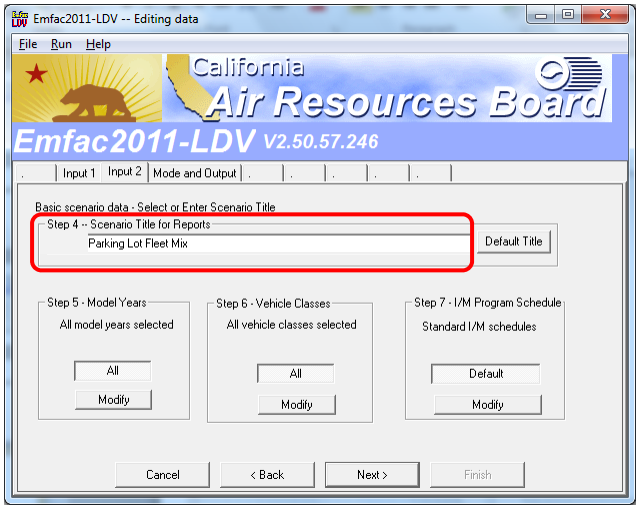
- Step 1 - Select “County”, “Sacramento”
- Step 2 - Select “2020”
- Step 3 - Select “Annual”
- Click “Next”

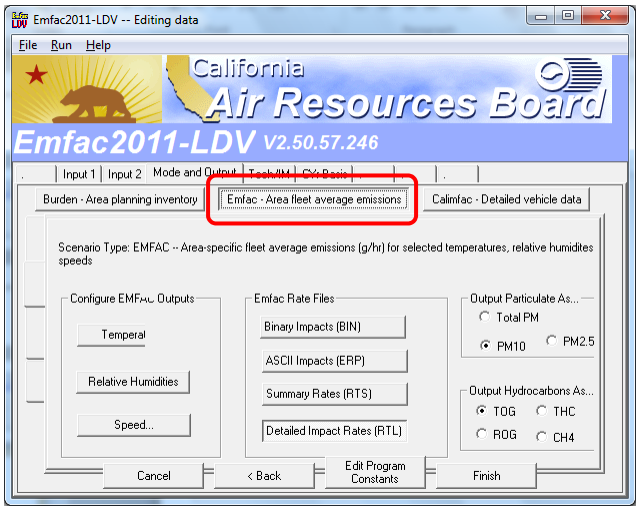


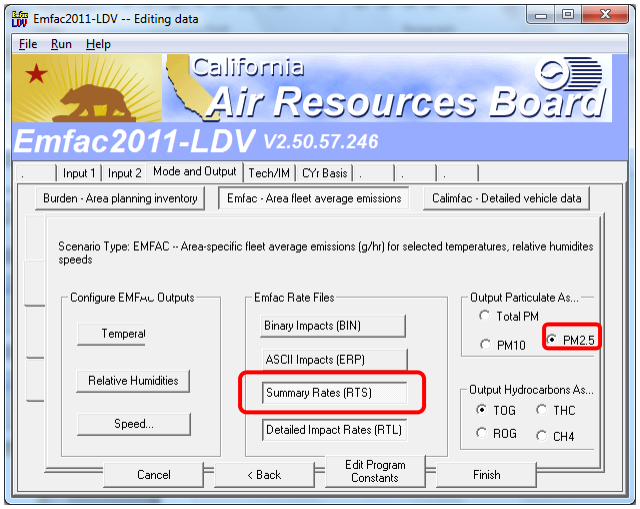


Input 2 Tab

- Step 4 – Select a Scenario Title name
- Then Click “Next”
- Select “Emfac – Area fleet average emissions”
- Click on “Summary Rates (RTS)” and Output Particulate as “PM2.5”; “Detailed Impact Rates (RTL)” will already be selected

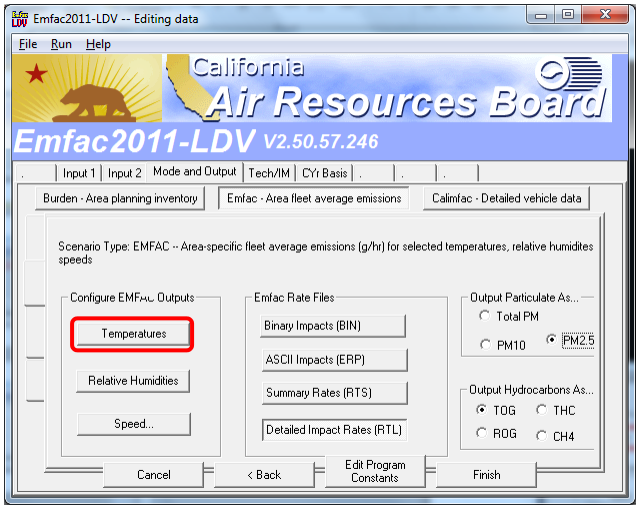

Emfac2011-LDV -- Editing data
File Run Help
California
Air Resources Board
Emfac2011-LDV V2.50.57.246
Input 1 Input 2 Mode and Output
Basic scenario data - Select or Enter Scenario Title
Step 4 -- Scenario Title for Reports
Parking Lot Fleet Mix
Default Title
Step 5 - Model Years
All model years selected
All
Modify
Step 6 - Vehicle Classes
All vehicle classes selected
All
Modify
Step 7 - I/M Program Schedule
Standard I/M schedules
Default
Modify
Cancel
< Back
Next >
Finish

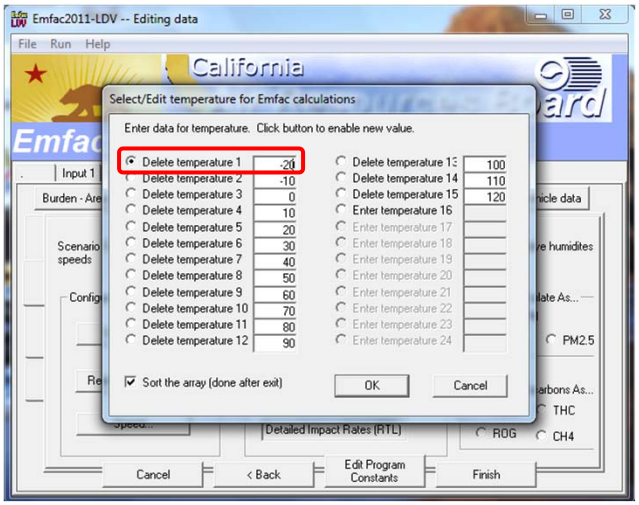

Emfac2011-LDV -- Editing data
File Run Help
California
Air Resources Board
Emfac2011-LDV V2.50.57.246
Input 1 Input 2 Mode and Output
Burden - Area planning inventory
Emfac - Area fleet average emissions
Calimfac - Detailed vehicle data
Scenario Type: EMFAC -- Area-specific fleet average emissions (g/hr) for selected temperatures, relative humidites speeds
Configure EMFAC Outputs
Temperat
Relative Humidities
Speed...
Emfac Rate Files
Binary Impacts (BIN)
ASCII Impacts (ERP)
Summary Rates (RTS)
Detailed Impact Rates (RTL)
Output Particulate As...
Total PM
PM10
PM2.5
Output Hydrocarbons As...
TOG
THC
ROG
CH4
Cancel
< Back
Edit Program Constants
Finish

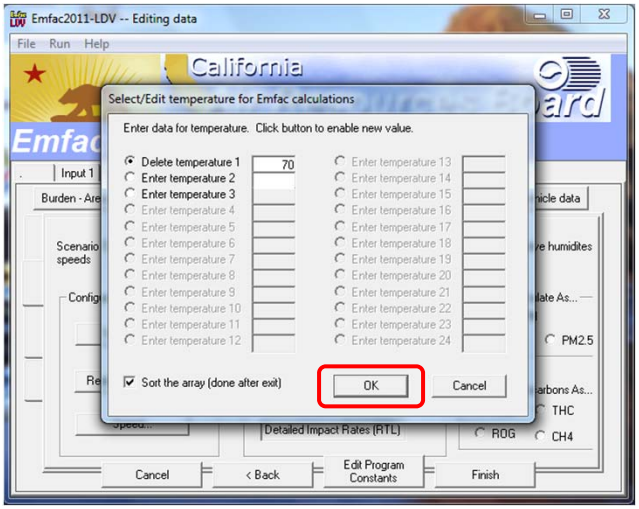


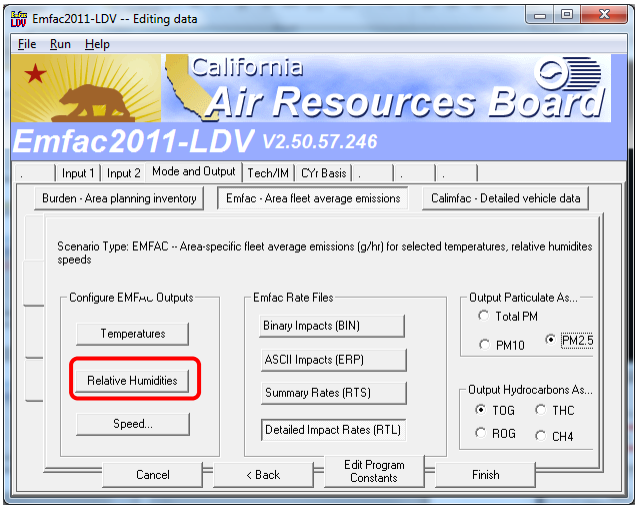
Edit Program Constants

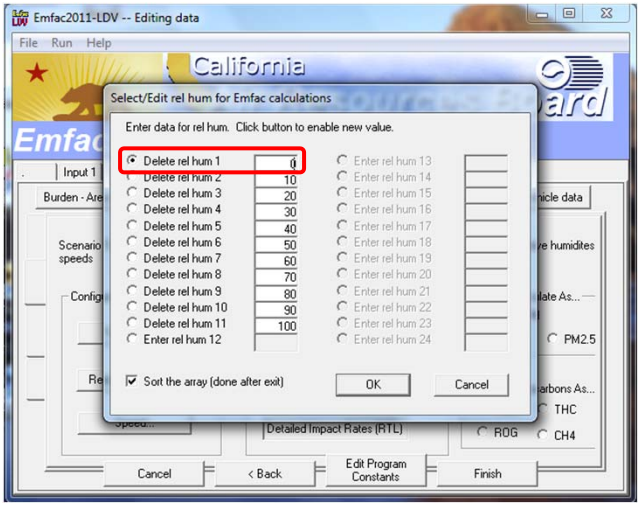
- Select “Temperature”
- Delete all temperatures except 70
- Select “Relative Humidities”
- Delete all except 70
- Click “Finish”

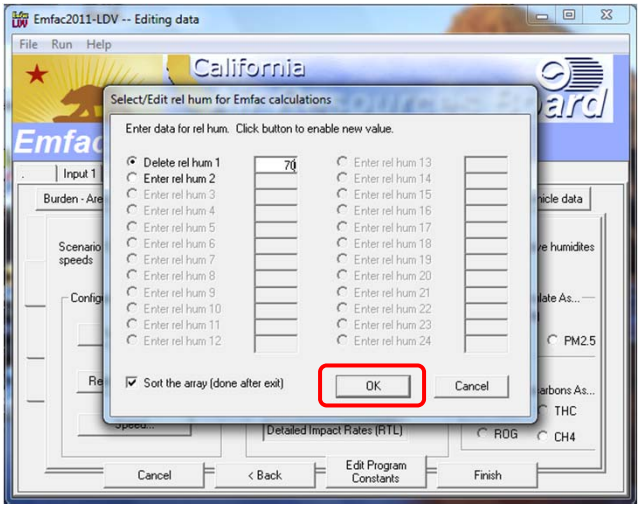

Emfac2011-LDV -- Editing data
File Run Help
California
Air Resources Board
Emfac2011-LDV V2.50.57.246
Input 1 Input 2 Mode and Output Tech/IM CYr Basis
Burden - Area planning inventory
Emfac - Area fleet average emissions
Calimfac - Detailed vehicle data
Scenario Type: EMFAC -- Area-specific fleet average emissions (g/hr) for selected temperatures, relative humidites speeds
Configure EMFAC Outputs
Temperatures
Relative Humidities
Speed...
Emfac Rate Files
Binary Impacts (BIN)
ASCII Impacts (ERP)
Summary Rates (RTS)
Detailed Impact Rates (RTL)
Output Particulate As...
Total PM
PM10
PM2.5
Output Hydrocarbons As...
TOG
THC
ROG
CH4
Cancel
< Back
Edit Program Constants
Finish

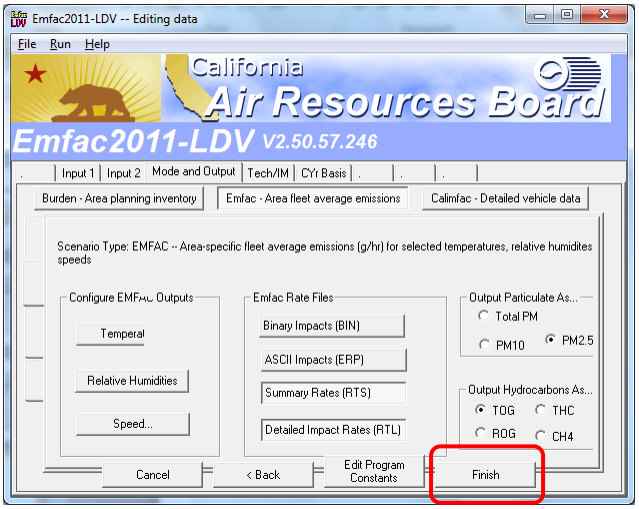

Emfac2011-LDV -- Editing data
File Run Help
California
Select/Edit temperature for Emfac calculations
Enter data for temperature. Click button to enable new value.
Delete temperature 1 -20
Delete temperature 2 -10
Delete temperature 3 0
Delete temperature 4 10
Delete temperature 5 20
Delete temperature 6 30
Delete temperature 7 40
Delete temperature 8 50
Delete temperature 9 60
Delete temperature 10 70
Delete temperature 11 80
Delete temperature 12 90
Delete temperature 13 100
Delete temperature 14 110
Delete temperature 15 120
Enter temperature 16
Enter temperature 17
Enter temperature 18
Enter temperature 19
Enter temperature 20
Enter temperature 21
Enter temperature 22
Enter temperature 23
Enter temperature 24
Sort the array (done after exit)
OK
Cancel
Detailed Impact Rates (RTL)
ROG
CH4
Cancel
< Back
Edit Program Constants
Finish


Emfac2011-LDV -- Editing data
File Run Help
California
Select/Edit temperature for Emfac calculations
Enter data for temperature. Click button to enable new value.
Delete temperature 1
70
Enter temperature 2
Enter temperature 3
Sort the array (done after exit)
OK
Cancel
Detailed Impact Rates (RTL)
Cancel
< Back
Edit Program Constants
Finish


Emfac2011-LDV -- Editing data
File Run Help
California
Air Resources Board
Emfac2011-LDV V2.50.57.246
Input 1 Input 2 Mode and Output Tech/IM CYr Basis
Burden - Area planning inventory
Emfac - Area fleet average emissions
Calimfac - Detailed vehicle data
Scenario Type: EMFAC -- Area-specific fleet average emissions (g/hr) for selected temperatures, relative humidites speeds
Configure EMFAC Outputs
Temperatures
Relative Humidities
Speed...
Emfac Rate Files
Binary Impacts (BIN)
ASCII Impacts (ERP)
Summary Rates (RTS)
Detailed Impact Rates (RTL)
Output Particulate As...
Total PM
PM10
PM2.5
Output Hydrocarbons As...
TOG
THC
ROG
CH4
Cancel
< Back
Edit Program Constants
Finish

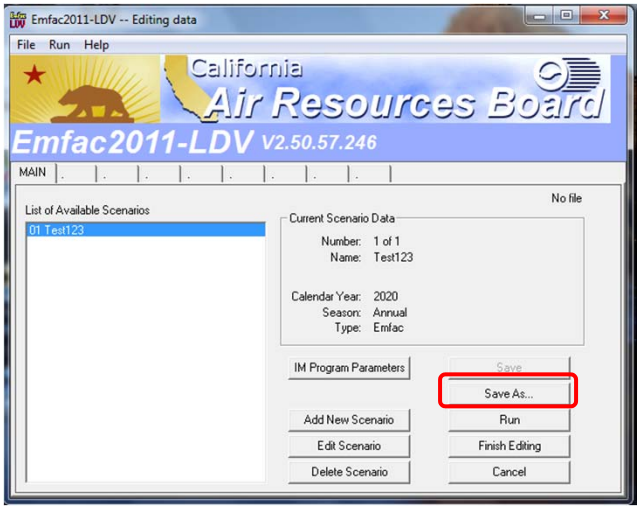

Emfac2011-LDV -- Editing data
File Run Help
California
Select/Edit rel hum for Emfac calculations
Enter data for rel hum. Click button to enable new value.
Delete rel hum 1 0
Delete rel hum 2 10
Delete rel hum 3 20
Delete rel hum 4 30
Delete rel hum 5 40
Delete rel hum 6 50
Delete rel hum 7 60
Delete rel hum 8 70
Delete rel hum 9 80
Delete rel hum 10 90
Delete rel hum 11 100
Enter rel hum 12
Enter rel hum 13
Enter rel hum 14
Enter rel hum 15
Enter rel hum 16
Enter rel hum 17
Enter rel hum 18
Enter rel hum 19
Enter rel hum 20
Enter rel hum 21
Enter rel hum 22
Enter rel hum 23
Enter rel hum 24
Sort the array (done after exit)
OK
Cancel
Input 1
Burden - Are
Scenario speeds
Config
Detailed Impact Rates (RTL)
ROG
CH4
THC
PM2.5
Cancel
< Back
Edit Program Constants
Finish

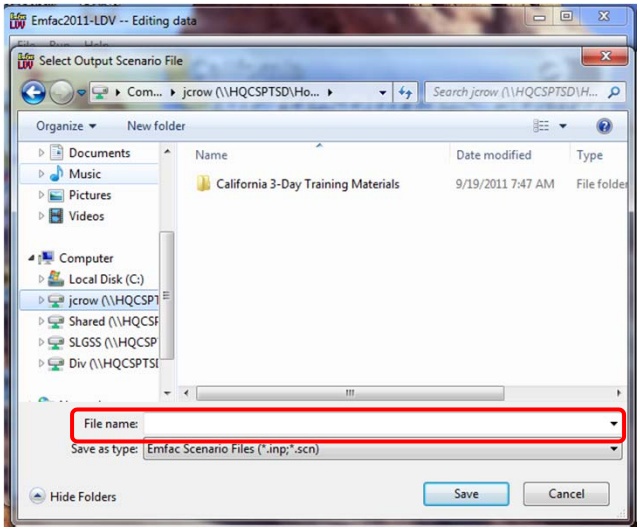

Emfac2011-LDV -- Editing data
File Run Help
California
Select/Edit rel hum for Emfac calculations
Enter data for rel hum. Click button to enable new value.
Delete rel hum 1 70
Enter rel hum 2
Enter rel hum 3
Enter rel hum 4
Enter rel hum 5
Enter rel hum 6
Enter rel hum 7
Enter rel hum 8
Enter rel hum 9
Enter rel hum 10
Enter rel hum 11
Enter rel hum 12
Enter rel hum 13
Enter rel hum 14
Enter rel hum 15
Enter rel hum 16
Enter rel hum 17
Enter rel hum 18
Enter rel hum 19
Enter rel hum 20
Enter rel hum 21
Enter rel hum 22
Enter rel hum 23
Enter rel hum 24
Sort the array (done after exit)
OK
Cancel
Input 1
Burden - Are
Scenario speeds
Config
Detailed Impact Rates (RTL)
ROG
CH4
THC
PM2.5
Cancel
< Back
Edit Program Constants
Finish

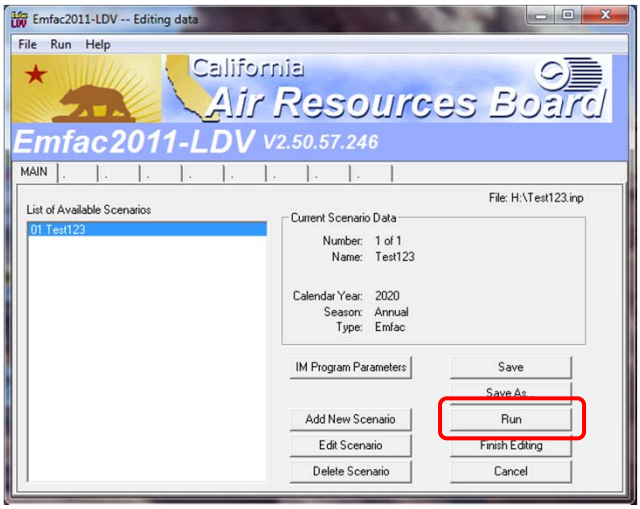


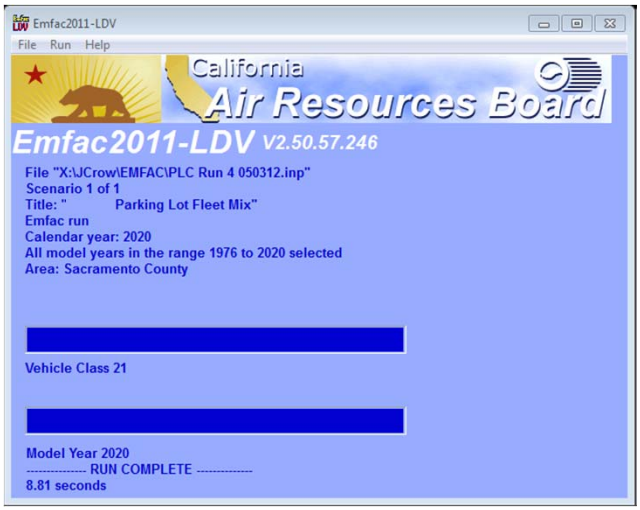
Save Scenario Inputs

- Click “Save As”
- Give the file a name
- Click “Run”
- After the run is completed, open the ‘.rts’ file in Microsoft Notepad
- Select the values for “All” for “5”, “360”, and “720” minutes

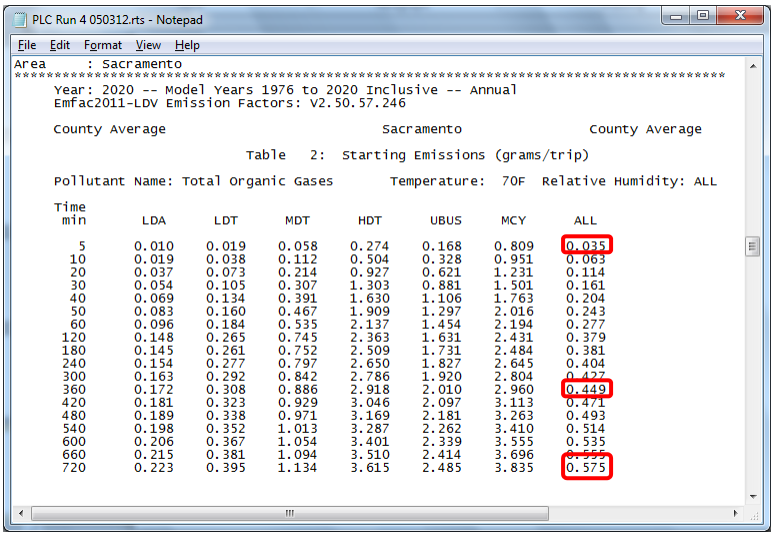

Emfac2011-LDV -- Editing data
File Run Help
California
Air Resources Board
Emfac2011-LDV V2.50.57.246
MAIN
No file
List of Available Scenarios
01 Test123
Current Scenario Data
Number: 1 of 1
Name: Test123
Calendar Year: 2020
Season: Annual
Type: Emfac
IM Program Parameters
Save
Save As...
Add New Scenario
Run
Edit Scenario
Finish Editing
Delete Scenario
Cancel


Emfac2011-LDV -- Editing data
Select Output Scenario File
Organize
New folder
Documents
Music
Pictures
Videos
Computer
Local Disk (C:)
Name
Date modified
Type
California 3-Day Training Materials
9/19/2011 7:47 AM
File name:
Save as type: Emfac Scenario Files (*.inp;*.scn)
Hide Folders
Save
Cancel


Emfac2011-LDV -- Editing data
File Run Help
California
Air Resources Board
Emfac2011-LDV V2.50.57.246
MAIN
File: H:\Test123.inp
List of Available Scenarios
01 Test123
Current Scenario Data
Number: 1 of 1
Name: Test123
Calendar Year: 2020
Season: Annual
Type: Emfac
IM Program Parameters
Save
Save As...
Add New Scenario
Run
Edit Scenario
Finish Editing
Delete Scenario
Cancel


Emfac2011-LDV
File Run Help
California
Air Resources Board
Emfac2011-LDV V2.50.57.246
File "X:\JCrow\EMFAC\PLC Run 4 050312.inp"
Scenario 1 of 1
Title: " Parking Lot Fleet Mix"
Emfac run
Calendar year: 2020
All model years in the range 1976 to 2020 selected
Area: Sacramento County
Vehicle Class 21
Model Year 2020
---------- RUN COMPLETE ----------
8.81 seconds

Model Outputs



PLC Run 4 050312.rts - Notepad

File Edit Format View Help

Area : Sacramento

Year: 2020 -- Model Years 1976 to 2020 Inclusive -- Annual
Emfac2011-LDV Emission Factors: V2.50.57.246

County Average Sacramento County Average

Table 2: Starting Emissions (grams/trip)

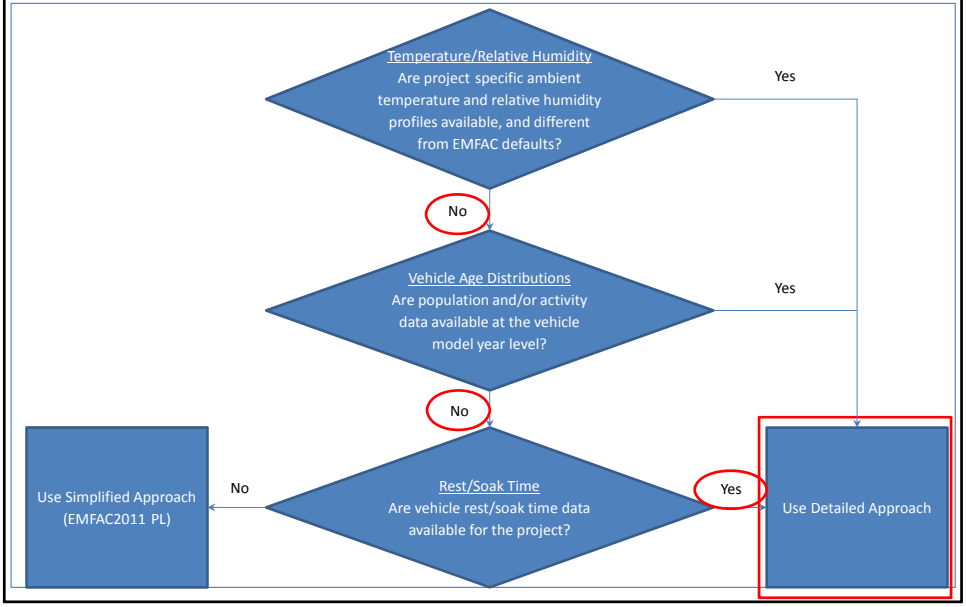
Pollutant Name: Total Organic Gases Temperature: 70F Relative Humidity: ALL

Time min	LDA	LDT	MDT	HDT	UBUS	MCY	ALL
5	0.010	0.019	0.058	0.274	0.168	0.809	0.035
10	0.019	0.038	0.112	0.504	0.328	0.951	0.063
20	0.037	0.073	0.214	0.927	0.621	1.231	0.114
30	0.054	0.105	0.307	1.303	0.881	1.501	0.161
40	0.069	0.134	0.391	1.630	1.106	1.763	0.204
50	0.083	0.160	0.467	1.909	1.297	2.016	0.243
60	0.096	0.184	0.535	2.137	1.454	2.194	0.277
120	0.148	0.265	0.745	2.363	1.631	2.431	0.379
180	0.145	0.261	0.752	2.509	1.731	2.484	0.381
240	0.154	0.277	0.797	2.650	1.827	2.645	0.404
300	0.163	0.292	0.842	2.786	1.920	2.804	0.427
360	0.172	0.308	0.886	2.918	2.010	2.960	0.449
420	0.181	0.323	0.929	3.046	2.097	3.113	0.471
480	0.189	0.338	0.971	3.169	2.181	3.263	0.493
540	0.198	0.352	1.013	3.287	2.262	3.410	0.514
600	0.206	0.367	1.054	3.401	2.339	3.555	0.535
660	0.215	0.381	1.094	3.510	2.414	3.696	0.555
720	0.223	0.395	1.134	3.615	2.485	3.835	0.575

Scenario #7: LDV + HD Vehicles

- Pollutant of interest: PM2.5
- Region: Los Angeles County
- Calendar Year: 2020
- Season: Annual
- Vehicle Class: LDA + HHDT (DSL) only
- Model Year: 2020 only
- Speed: 60 MPH
- Soak time: 360 minutes
- Idle time: 60 minutes

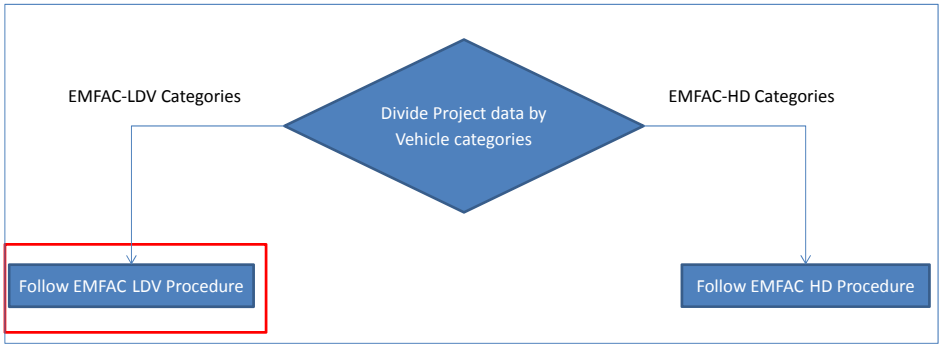
Protocol



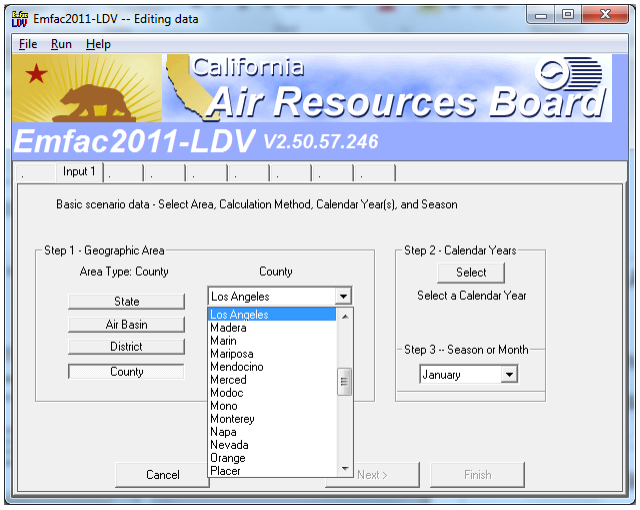
Approach Summary

- Step 1: Run EMFAC LDV for LDA Only
- Step 2: Use EMFAC Web Database for T7-DSL
  - Download "by Speed" output for RUNEX
  - Download "Combined Speed" output for Other
  - Download "Idle Emission Rate Inventory" for IDLEX

Step 1: LDV Procedure

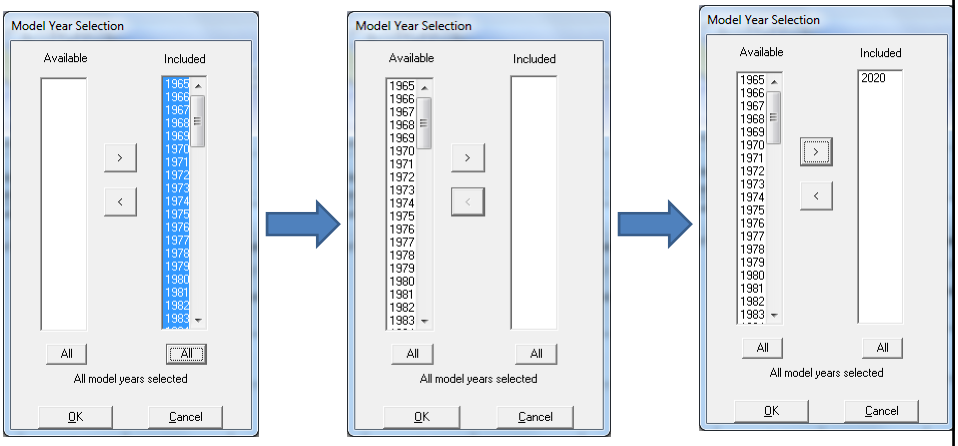


Select Region type and Region

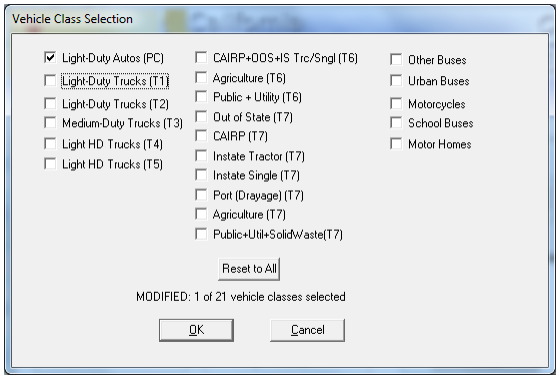


Select Calendar Year and Season

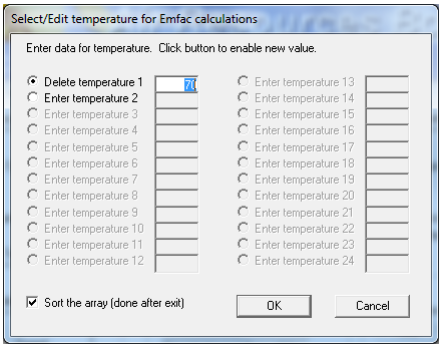
Select Model Years

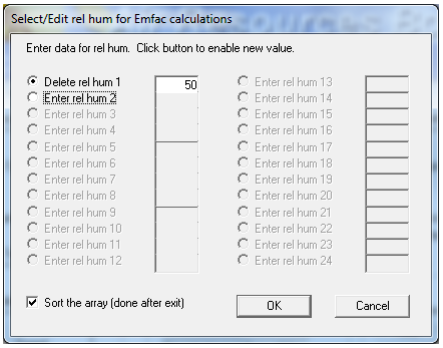


Select Vehicle Type

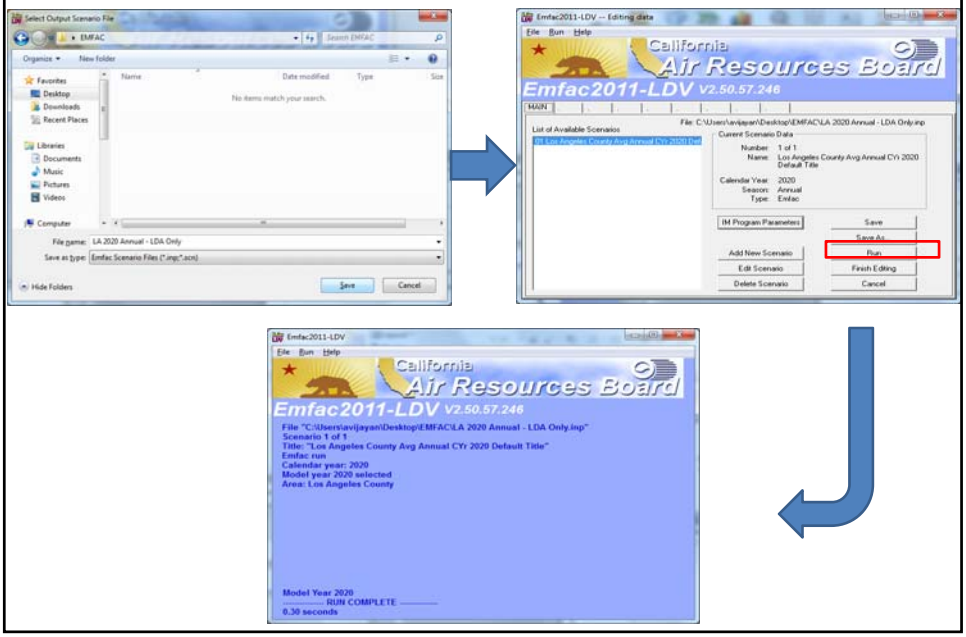


Select Temperature & Relative Humidity





Save Inputs & Run



LDA Output:
RUNEX (Running Emission Rate)

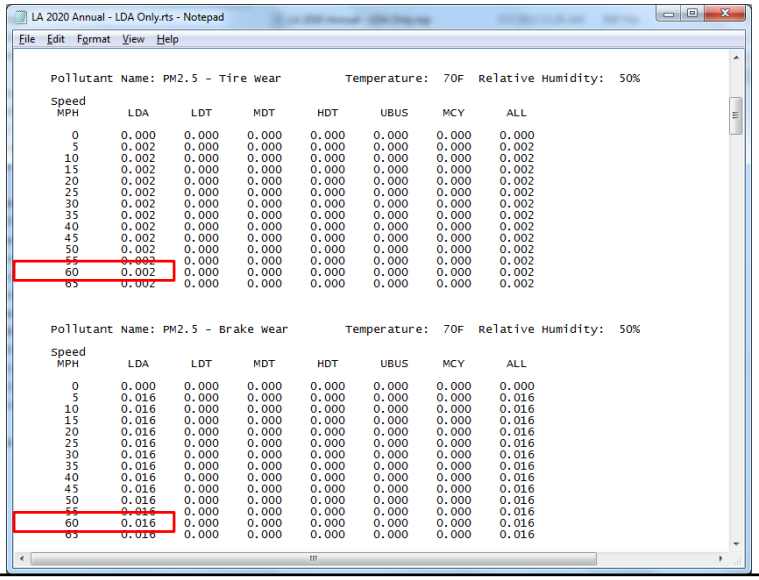
LA 2020 Annual - LDA Only.rts - Notepad

File Edit Format View Help

```
Area      : Los Angeles
*******************************************************************************
     Year: 2020 -- Model Years 2020 to 2020 Inclusive -- Annual
     Emfac2011-LDV Emission Factors: V2.50.57.246

     County Average                        Los Angeles              County Average

                              Table   1:  Running Exhaust Emissions (grams/mile; grams/idle-hour)

     Pollutant Name: PM2.5                    Temperature:  70F  Relative Humidity:  50%

     Speed
      MPH        LDA       LDT       MDT       HDT       UBUS      MCY       ALL

        0        0.000     0.000     0.000     0.000     0.000     0.000     0.000
        5        0.010     0.000     0.000     0.000     0.000     0.000     0.010
       10        0.007     0.000     0.000     0.000     0.000     0.000     0.007
       15        0.004     0.000     0.000     0.000     0.000     0.000     0.004
       20        0.003     0.000     0.000     0.000     0.000     0.000     0.003
       25        0.002     0.000     0.000     0.000     0.000     0.000     0.002
       30        0.002     0.000     0.000     0.000     0.000     0.000     0.002
       35        0.002     0.000     0.000     0.000     0.000     0.000     0.002
       40        0.001     0.000     0.000     0.000     0.000     0.000     0.001
       45        0.001     0.000     0.000     0.000     0.000     0.000     0.001
       50        0.001     0.000     0.000     0.000     0.000     0.000     0.001
       55        0.001     0.000     0.000     0.000     0.000     0.000     0.001
       60        0.002     0.000     0.000     0.000     0.000     0.000     0.002
       65        0.002     0.000     0.000     0.000     0.000     0.000     0.002
```

- Since LDA emission rates for Speed 0 MPH [idling] are 0, the 5 MPH Running Emission Rate (g/mile) is converted to Idling Emission Rate (g/hr)
- Multiply the 5 MPH Emission rate (g/mile) by speed (5 miles/hr) to calculate Idling ER (g/hr)
- Idling Emission Rate = 0.010 (g/mile) X 5 (mile/hr) = 0.050 g/hr

LDA Output:
PM Brake Wear + Tire Wear



LA 2020 Annual - LDA Only.rts - Notepad

File Edit Format View Help

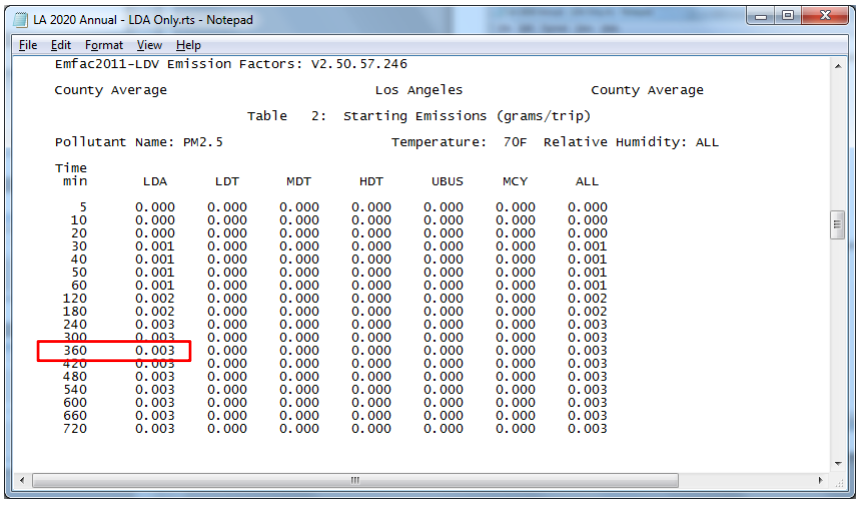
Pollutant Name: PM2.5 - Tire Wear Temperature: 70F Relative Humidity: 50%

Speed MPH	LDA	LDT	MDT	HDT	UBUS	MCY	ALL
0	0.000	0.000	0.000	0.000	0.000	0.000	0.000
5	0.002	0.000	0.000	0.000	0.000	0.000	0.002
10	0.002	0.000	0.000	0.000	0.000	0.000	0.002
15	0.002	0.000	0.000	0.000	0.000	0.000	0.002
20	0.002	0.000	0.000	0.000	0.000	0.000	0.002
25	0.002	0.000	0.000	0.000	0.000	0.000	0.002
30	0.002	0.000	0.000	0.000	0.000	0.000	0.002
35	0.002	0.000	0.000	0.000	0.000	0.000	0.002
40	0.002	0.000	0.000	0.000	0.000	0.000	0.002
45	0.002	0.000	0.000	0.000	0.000	0.000	0.002
50	0.002	0.000	0.000	0.000	0.000	0.000	0.002
55	0.002	0.000	0.000	0.000	0.000	0.000	0.002
60	0.002	0.000	0.000	0.000	0.000	0.000	0.002
65	0.002	0.000	0.000	0.000	0.000	0.000	0.002

Pollutant Name: PM2.5 - Brake Wear Temperature: 70F Relative Humidity: 50%

Speed MPH	LDA	LDT	MDT	HDT	UBUS	MCY	ALL
0	0.000	0.000	0.000	0.000	0.000	0.000	0.000
5	0.016	0.000	0.000	0.000	0.000	0.000	0.016
10	0.016	0.000	0.000	0.000	0.000	0.000	0.016
15	0.016	0.000	0.000	0.000	0.000	0.000	0.016
20	0.016	0.000	0.000	0.000	0.000	0.000	0.016
25	0.016	0.000	0.000	0.000	0.000	0.000	0.016
30	0.016	0.000	0.000	0.000	0.000	0.000	0.016
35	0.016	0.000	0.000	0.000	0.000	0.000	0.016
40	0.016	0.000	0.000	0.000	0.000	0.000	0.016
45	0.016	0.000	0.000	0.000	0.000	0.000	0.016
50	0.016	0.000	0.000	0.000	0.000	0.000	0.016
55	0.016	0.000	0.000	0.000	0.000	0.000	0.016
60	0.016	0.000	0.000	0.000	0.000	0.000	0.016
65	0.016	0.000	0.000	0.000	0.000	0.000	0.016

LDA Output:
STREX (Starting Emission Rate)



LA 2020 Annual - LDA Only.rts - Notepad

File Edit Format View Help

Emfac2011-LDV Emission Factors: V2.50.57.246

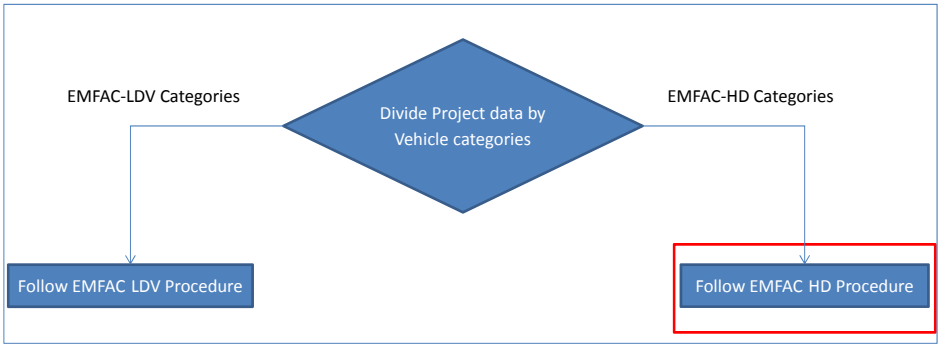
County Average Los Angeles County Average

Table 2: Starting Emissions (grams/trip)

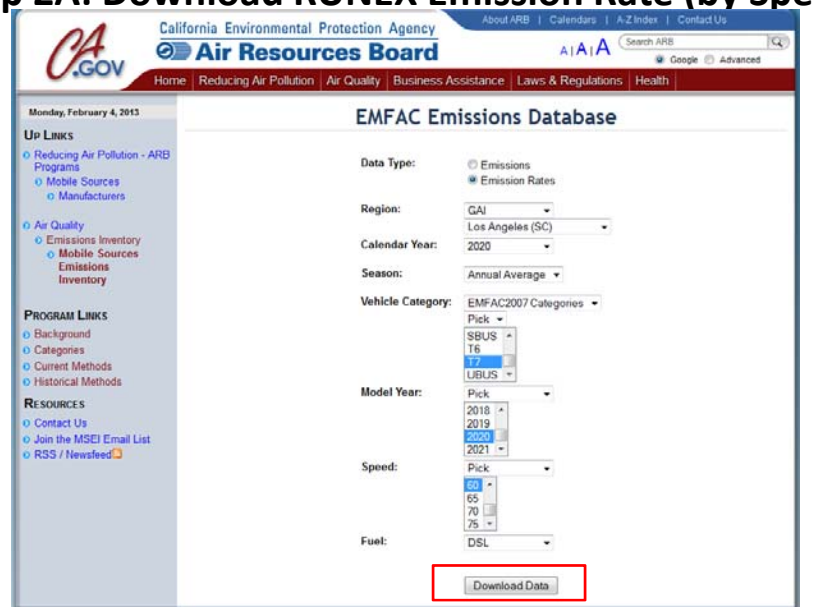
Pollutant Name: PM2.5 Temperature: 70F Relative Humidity: ALL

Time min	LDA	LDT	MDT	HDT	UBUS	MCY	ALL
5	0.000	0.000	0.000	0.000	0.000	0.000	0.000
10	0.000	0.000	0.000	0.000	0.000	0.000	0.000
20	0.000	0.000	0.000	0.000	0.000	0.000	0.000
30	0.001	0.000	0.000	0.000	0.000	0.000	0.001
40	0.001	0.000	0.000	0.000	0.000	0.000	0.001
50	0.001	0.000	0.000	0.000	0.000	0.000	0.001
60	0.001	0.000	0.000	0.000	0.000	0.000	0.001
120	0.002	0.000	0.000	0.000	0.000	0.000	0.002
180	0.002	0.000	0.000	0.000	0.000	0.000	0.002
240	0.003	0.000	0.000	0.000	0.000	0.000	0.003
300	0.003	0.000	0.000	0.000	0.000	0.000	0.003
360	0.003	0.000	0.000	0.000	0.000	0.000	0.003
420	0.003	0.000	0.000	0.000	0.000	0.000	0.003
480	0.003	0.000	0.000	0.000	0.000	0.000	0.003
540	0.003	0.000	0.000	0.000	0.000	0.000	0.003
600	0.003	0.000	0.000	0.000	0.000	0.000	0.003
660	0.003	0.000	0.000	0.000	0.000	0.000	0.003
720	0.003	0.000	0.000	0.000	0.000	0.000	0.003

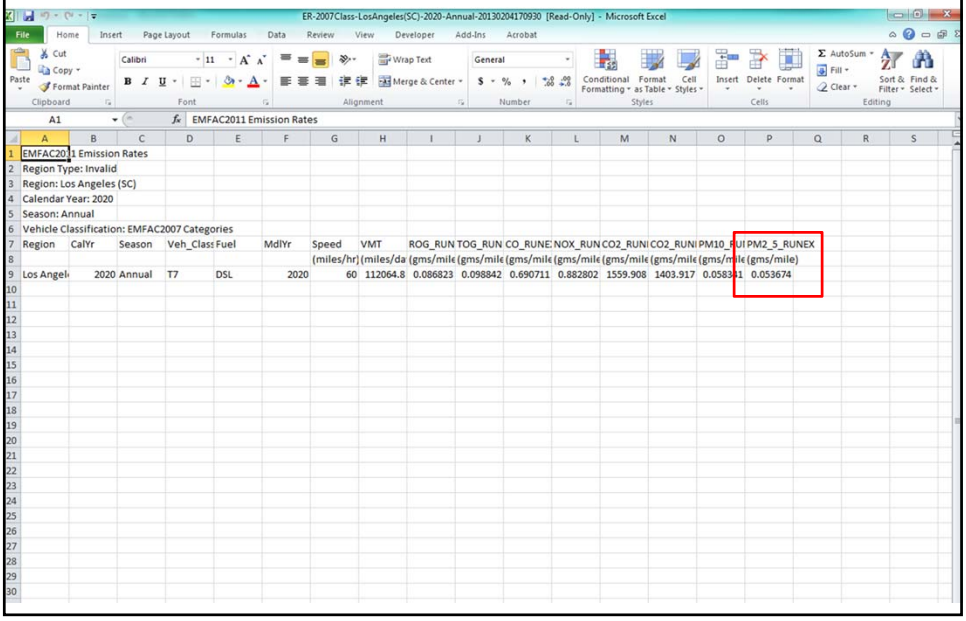
Step 2: HD Procedure



Step 2A: Download RUNEX Emission Rate (by Speed)



ER Output: RUNEX Only



ER-2007Class-LosAngeles(SC)-2020-Annual-20130204170930 [Read-Only] - Microsoft Excel

A1: EMFAC2011 Emission Rates

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S
1	EMFAC2011 Emission Rates																		
2	Region Type: Invalid																		
3	Region: Los Angeles (SC)																		
4	Calendar Year: 2020																		
5	Season: Annual																		
6	Vehicle Classification: EMFAC2007 Categories																		
7	Region	CalYr	Season	Veh_Class	Fuel	MdlYr	Speed	VMT	ROG_RUN	TOG_RUN	CO_RUNE	NOX_RUN	CO2_RUN	CO2_RUN	PM10_RU	PM2_5_RUNEX			
8							(miles/hr)	(miles/da	(gms/mile	(gms/mile	(gms/mile	(gms/mile	(gms/mile	(gms/mile	(gms/mile	(gms/mile)			
9	Los Angel	2020	Annual	T7	DSL	2020	60	112064.8	0.086823	0.098842	0.690711	0.882802	1559.908	1403.917	0.058341	0.053674			
10																			
11																			
12																			
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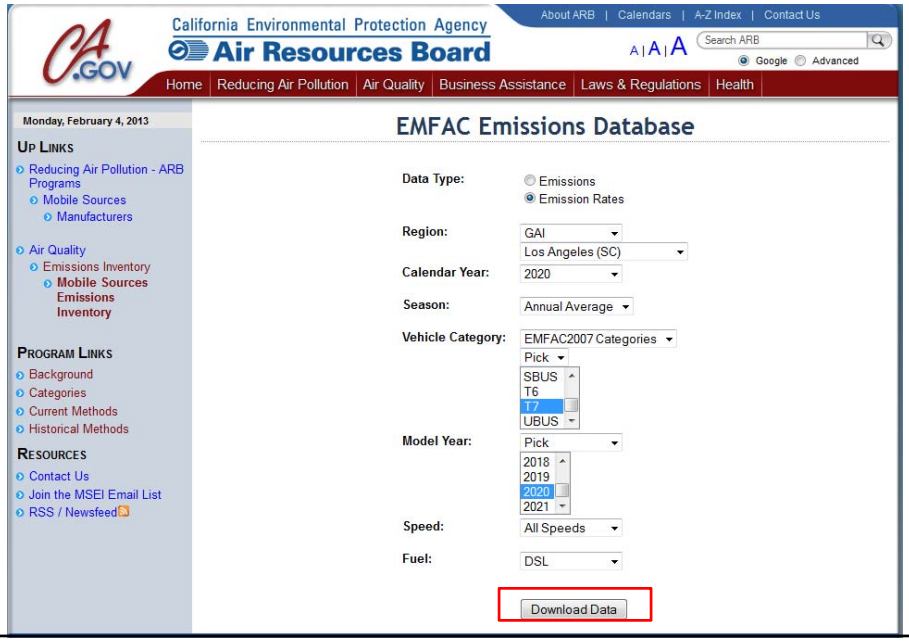
30																			

Step 2B: Download Other ERs (Combined Speed)



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Air Resources Board

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Monday, February 4, 2013

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    - Mobile Sources Emissions Inventory

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EMFAC Emissions Database

Data Type: Emissions / Emission Rates

Region: GAI / Los Angeles (SC)

Calendar Year: 2020

Season: Annual Average

Vehicle Category: EMFAC2007 Categories — Pick — SBUS, T6, T7, UBUS

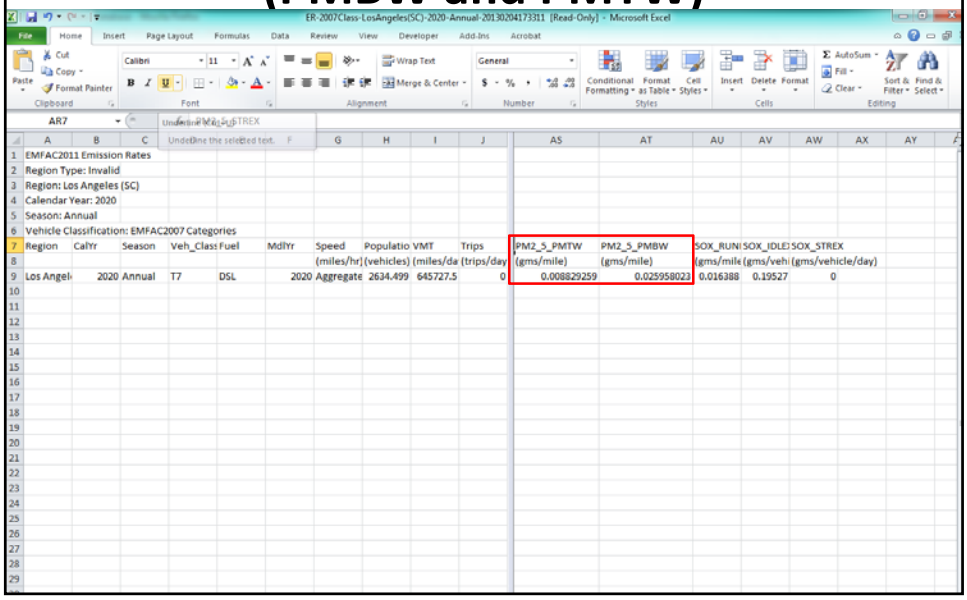
Model Year: Pick — 2018, 2019, 2020, 2021

Speed: All Speeds

Fuel: DSL

Download Data

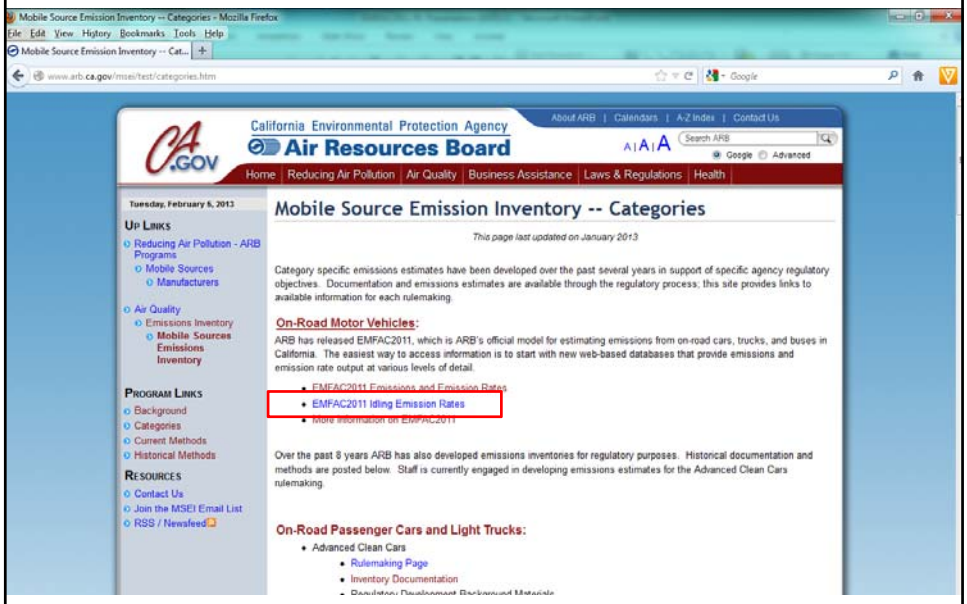
ER Output: Other Processes (PMBW and PMTW)



ER-2007Class-LosAngeles(SC)-2020-Annual-20130204173311 [Read-Only] - Microsoft Excel

	A	B	C	G	H	I	J	AS	AT	AU	AV	AW	AX	AY
1	EMFAC2011 Emission Rates													
2	Region Type: Invalid													
3	Region: Los Angeles (SC)													
4	Calendar Year: 2020													
5	Season: Annual													
6	Vehicle Classification: EMFAC2007 Categories													
7	Region	CalYr	Season	Veh_Class	Fuel	MdlYr	Speed	Populatio	VMT	Trips	PM2_5_PMTW	PM2_5_PMBW	SOX_RUNI	SOX_IDLE	SOX_STREX	
8							(miles/hr)	(vehicles)	(miles/da	(trips/day	(gms/mile)	(gms/mile)	(gms/mile	(gms/vehi	(gms/vehicle/day)	
9	Los Angel	2020	Annual	T7	DSL	2020	Aggregate	2634.499	645727.5	0	0.008829259	0.025958023	0.016388	0.19527	0	

Step 2C: Download IDLEX ER



Mobile Source Emission Inventory -- Categories - Mozilla Firefox

California Environmental Protection Agency
Air Resources Board

Home | Reducing Air Pollution | Air Quality | Business Assistance | Laws & Regulations | Health

Tuesday, February 5, 2013

Up Links
- Reducing Air Pollution - ARB Programs
  - Mobile Sources
    - Manufacturers
- Air Quality
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    - Mobile Sources Emissions Inventory

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Mobile Source Emission Inventory -- Categories

This page last updated on January 2013

Category specific emissions estimates have been developed over the past several years in support of specific agency regulatory objectives. Documentation and emissions estimates are available through the regulatory process; this site provides links to available information for each rulemaking.

On-Road Motor Vehicles:

ARB has released EMFAC2011, which is ARB's official model for estimating emissions from on-road cars, trucks, and buses in California. The easiest way to access information is to start with new web-based databases that provide emissions and emission rate output at various levels of detail.

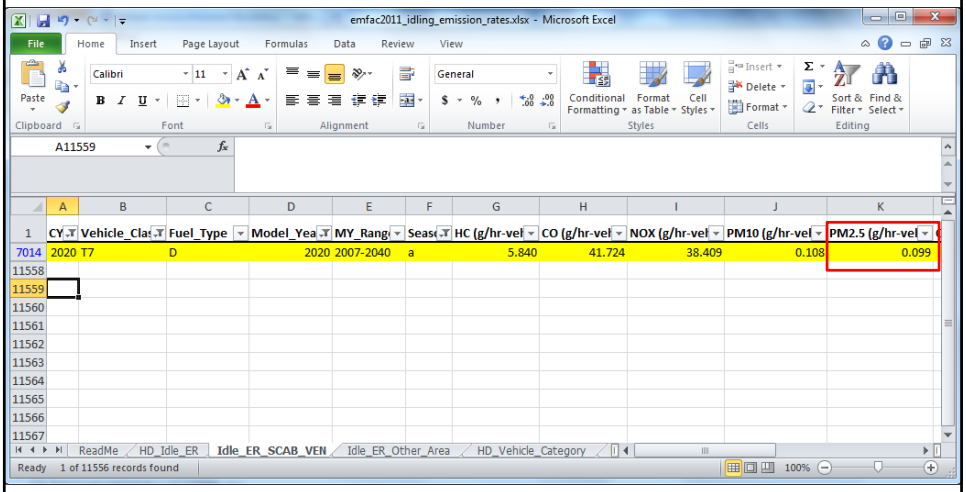
- EMFAC2011 Emissions and Emission Rates
- EMFAC2011 Idling Emission Rates
- More information on EMFAC2011

Over the past 8 years ARB has also developed emissions inventories for regulatory purposes. Historical documentation and methods are posted below. Staff is currently engaged in developing emissions estimates for the Advanced Clean Cars rulemaking.

On-Road Passenger Cars and Light Trucks:

- Advanced Clean Cars
  - Rulemaking Page
  - Inventory Documentation

ER Output: IDLEX ER



End