South Coast AQMD Airport MOUs
Methodology for Calculating Ground Support Equipment
Fleet Average Emission Factor

On December 6, 2019, the South Coast Air Quality Management District (South Coast AQMD) Governing Board voted to approve a set of Memoranda of Understanding (MOU) with five commercial airports to reduce emissions as part of the 2016 Air Quality Management Plan (AQMP) Facility-Based Mobile Source Measures, including MOB-04: Emission Reductions at Commercial Airport**.** The five commercial airports are: Los Angeles International Airport (LAX), Long Beach Airport (LGB), Hollywood Burbank Airport (BUR), John Wayne Airport (SNA), and Ontario International Airport (ONT).

Under the executed MOUs with the South Coast AQMD, each of these five airports shall implement an Air Quality Improvement Plan/Measure (AQIP/AQIM) to meet airport-specific fleet performance targets for ground support equipment (GSE). These performance targets are expressed as emission factors for nitrogen oxides (NOx)[1] in gram per brake horsepower per hour (g/bhp-hr). Chapter 3 Section B of the 2019 Airport MOU Staff Report[2] outlines AQIP/AQIM commitments for each airport. A summary of the GSE fleet performance targets specified in the 2019 Staff Report for each airport is shown below:

Airport	GSE Fleet Performance Target	
	By January 1, 2023	By January 1, 2031
LAX	1.8 g/bhp-hr	1.00 g/bhp-hr
LGB	0.92 g/bhp-hr	0.44 g/bhp-hr
BUR	1.66 g/bhp-hr	0.74 g/bhp-hr
SNA	1.70 g/bhp-hr	0.90 g/bhp-hr
ONT	2.20 g/bhp-hr	1.10 g/bhp-hr

The original methodology used by each airport to develop its fleet performance targets for GSE measures needs to be applied each year to calculate the GSE fleet average emission factors (interchangeably referred to as "performance levels"), covering annual progress reports from 2020 to 2031. This approach ensures consistency when comparing the fleet average emission factors with the fleet performance targets for each of the five commercial airports.

While each airport has consistently calculated its calendar year 2017 baseline and the subsequent annual fleet average GSE emission factors, the methods differ among airports. Consequently, the performance targets and levels are not directly comparable across airports. Table 6 of the 2021 South Coast AQMD Airports MOU Implementation Progress Report,[3] which is duplicated here, summarizes the methods used to calculate the GSE fleet average emission factor for each airport:

[1] Performance targets for LAX expressed as g/bhp-hr NOx+Hydrocarbon

[2] http://www.aqmd.gov/docs/default-source/clean-air-plans/air-quality-management-plans/facility-based-mobile-source-measures/airports-final-staff-report.pdf

[3] https://www.aqmd.gov/docs/default-source/clean-air-plans/air-quality-management-plans/facility-based-mobile-source-measures/Final-2021-Airports-MOU-Implementation-Progress-Report.pdf

Airport	Source of emission factors	Calculation method
LAX	Engine standards	Horsepower weighted average
LGB	In-use emission factor, including load factor	Horsepower weighted average
BUR	In-use emission factor, including load factor	Horsepower weighted average
SNA	In-use emission factor, excluding load factor	Horsepower weighted average
ONT	In-use emission factor, excluding load factor, with certain equipment using engine standards	Arithmetic average

Except for all equipment at LAX and certain equipment at ONT, which use emission limits set in the corresponding engine standards, all other equipment uses in-use emission factors derived from the California Air Resources Board (CARB) emission models. For offroad equipment, the in-use emission factors are obtained from CARB's OFFROAD model by dividing total NOx emissions by the total annual horsepower-hours for each equipment type, based on fuel type, model year and horsepower bin. For on-road vehicles, in-use emission factors were derived from CARB's EMFAC model by dividing total NOx emissions by annual vehicle miles traveled (VMT) for each vehicle type and assumed speed, such as vehicle speed limits, based on model year and fuel type.

CARB emission models project future activities and the associated emissions based on best available information at the time of model development. However, year-over-year anomalies are occasionally observed. During the 2020 to 2022 reporting years, staff has worked with each of the five airports individually to address these anomalies on a case-by-case basis, which occurred most frequently for the oldest fleets that are close to the end of equipment life. While doing so, staff also made every effort to ensure consistency across how each case is resolved. As a result of this process, staff at the South Coast AQMD and the five airports mutually recognize the benefit of adding further clarity to the methodology used to calculate the annual GSE fleet average emission factors, specifically how to resolve the anomalies from CARB's OFFROAD model in order to limit year-over-year fluctuations when using in-use emission factors for a subset of GSE fleet.

This document memorializes the methodology and ongoing practice agreed upon to calculate and report GSE performance levels to ensure consistency and transparency for the remaining term of the Airport MOUs. This methodology document does not aim to standardize performance levels calculations across the five airports for reasons explained earlier.

For all equipment located at LAX and certain equipment located at ONT which utilize engine standards for GSE performance levels reporting, the same engine standard-based emission factors shall be used for the remaining life of the equipment. For other GSE classified as on-road vehicles, the calculation shall continue using in-use emission factors derived from the EMFAC model as described above. For other GSE classified as offroad equipment, the following methodology shall be used in order of operations as specified below:

1. Use default in-use emission factor derived from the OFFROAD model under the matching GSE category and for the same GSE type, fuel, model year and horsepower bin for the reporting calendar year. For any GSE with revised engine model year and/or fuel type as reviewed with South Coast AQMD staff after MOUs were executed, the revised parameters shall be used in this and the following steps.[4]

2. If the OFFROAD model does not have an exact match for the GSE category (including matching GSE type, fuel, model year, and horsepower bin) for the reporting calendar year but an exact match is available for the previous calendar year, use the emission factor for the matching category from the previous calendar year for the reporting calendar year.

3. If an exact match does not exist in the previous calendar year, check previous calendar years until finding an exact match.

4. If an exact match is unavailable for both reporting and previous calendar year(s), find the closest match in any combination of the model year and horsepower bin parameters for the same GSE type/fuel and use the corresponding OFFROAD model default in-use emission factor for the reporting calendar year.

5. If no match is found from the prior step, find the closest match in any combination of the model year, horsepower bin, and fuel type parameters for the same GSE type and use the corresponding OFFROAD model default in-use emission factor for the reporting calendar year.

6. Compare the selected OFFROAD emission factor resulted from the prior steps to the emission factor used in the 2017 baseline or the emission factor used in the first year that the equipment was reported (including the first year the model year and/or fuel type were approved to be revised). If the percentage difference for the same GSE is greater than or equal to 25% between the first used emission factor and the selected OFFROAD emission factor, the emission factor that was first chosen shall be used to calculate the GSE fleet average emission factor for the current reporting year. Clearly flag these cases, if any, for South Coast AQMD staff for further data quality checking.

[4] The GSE model year and/or fuel type may be revised to reflect physical modification such as engine repower or for administerial reasons.