



October 1, 2026

Elaine Shen, Planning and Rules Manager
South Coast Air Quality Management District
21865 Copley Drive
Diamond Bar, CA 91765-4178

Re: John Wayne Airport 2025 MOU Progress Report Update (Revision 1)

Dear Ms. Shen,

John Wayne Airport, Orange County ("SNA," "JWA," or "Airport") is pleased to submit this annual progress report as requested by the South Coast Air Quality Management District ("AQMD"). On December 6, 2019, a Memorandum of Understanding ("MOU") was entered into by the AQMD and the Airport, acting by and through the County of Orange, California ("County") in its capacity as the proprietor and certificated operator of JWA. The purpose of this annual progress report is to provide information concerning progress on the MOU measures. There are three measures in the JWA MOU, as related to non-aircraft commercial passenger airport mobile sources. These measures are intended to assist the AQMD in their effort to reach attainment for the 1997 and 2008 8-hour ozone national ambient air quality standards ("NAAQS") by 2023 and 2031, respectively. Information requested by AQMD on each of these measures, their associated equipment, and associated emissions is provided in the following sections. Oxides of Nitrogen ("NOx") and volatile organic compound ("VOC")¹ emissions are provided for each measure as these pollutants are considered ozone precursors.

MOU Schedule No. 1 – Ground Support Equipment

MOU Schedule No. 1 is a measure for GSE.² This measure requires that GSE associated with commercial operations achieve a fleet-average emission factor for NOx of 1.7 and 0.9 grams per brake horsepower hour (g/bhp-hr) in 2023 and 2031, respectively. To achieve this measure, the Airport has been working with Airport tenants and GSE operators to achieve the performance targets by specified dates through accelerated turnover to cleaner equipment.

¹ For purposes of this MOU, VOC emissions are assumed to be equal to ROG as calculated in the attached tables.

² Ground Support Equipment or "GSE" is any vehicle or equipment used to support aircraft operations that is subject to, or included in compliance plans to meet, the requirements of the California Air Resources Board ("CARB") In-Use Off-Road Diesel ("ORD") Vehicle Regulation Program, CARB Off-Road Large Spark-Ignition ("LSI") Engine Fleet Requirements Regulation Program, or CARB Portable Equipment Registration Program and associated Portable Diesel Engine Airborne Toxic Control Measure. Furthermore, GSE as defined here only includes equipment that is not subject to compliance with SCAQMD Rule XX – RECLAIM, or included in a mobile source emission reduction credit program under SCAQMD Rule XVI.

A list of GSE subject to this measure with the required information specified in MOU Schedule No. 1, Section III.B.1 is provided in **Table 1**. Information on the sale or retirement of non-zero emission GSE subject to this measure including information submitted to the California Air Resources Board Diesel Off-Road Online Reporting System (“DOORS”) database and any relocation details (as applicable) as required by MOU Schedule No. 1, Section III.B.2 is also presented in **Table 1**.

As noted in the CY 2021 MOU submittal, there are a few pieces of GSE that are used to support commercial aircraft activity at JWA for only a portion of the time (and otherwise used for other non-commercial activity). For these units, operator-specific information was provided regarding refueling activities for commercial aircraft vs. non-commercial aircraft, which was used to ratio annual activity for Jet-A Refuelers to better represent commercial-only aircraft-related emissions.³ Based on discussions with the operator, several ground power units are used to support non-commercial activity, however the annual ground power unit usage related to commercial-only activity is equal to the full operation of one unit.⁴ In March 2025, the operator which utilized GSE from a dual-service commercial and non-commercial GSE provider relocated within the airport and changed providers which resulted in the removal of several units from JWA’s commercial GSE inventory.

There are several ground power units in operation at JWA. These units are mainly on standby, as all but two commercial gate ramps have been electrified and are typically used by the majority of aircraft when parked at the gate. The emission estimates for ground power units are based on default activity derived from OFFROAD2017, which are anticipated to result in much more conservative estimates of use compared to actual use.

At the request of AQMD in September 2021, the GSE emission inventory methodology was revised to incorporate new engine standards for spark-ignited engines for gasoline-fueled equipment, and CARB’s 2017 ORD Emission Factors for diesel-fueled equipment (Method A). This revision updated the original GSE emission inventory methodology that was previously used to develop MOU targets using emissions calculated in OFFROAD2017 (Method B). Calculation methodologies for Method A and Method B are described below. The 2025 GSE emissions inventory calculated using Method A can be found in **Table 2**. The 2025 fleet averaged NOx emission factor calculated using Method B can be found in **Table 3**.

³ The operating hours for units 131-137 were calculated differently since these units only service commercial operations at JWA for a portion of their total usage time. Operating hours were estimated by multiplying OFFROAD default usage by the ratio of commercial gallons refueled to total gallons refueled in 2025. In 2024, there were 449,841 commercial-specific gallons refueled and 7,126,353 total gallons refueled. In 2025, there were 98,439 commercial-specific gallons refueled and 8,424,765 total gallons refueled. The percentage of commercial-specific usage was applied to each of the default OFFROAD values.

⁴ Operating hours for these nine GPU units were estimated as equivalent to the full usage of a single GPU based on OFFROAD defaults. This estimate was based on discussions with the operator.

Calculation Methodology

GSE emissions are based on an inventory of GSE equipment, provided by individual airlines and GSE operators at JWA for 2025. In the 2025 inventory, GSE identified as licensed for on-road use are not included; all other GSE (including small and low-use equipment) are included at the request of AQMD. A summary of all GSE included in the revised inventory can be found in **Table 4**.

Emission Factor Calculation – Method A

Model year specific emission factors were calculated based on the new engine standards for spark-ignited engines for gasoline-fueled equipment, and CARB's 2017 ORD Emission Factors for diesel-fueled equipment. For units powered by liquified petroleum gas (LPG), emission factors for gasoline-fueled equipment were used. NO_x and Reactive Organic Gas ("ROG") emission factors for combustion equipment were calculated by summing the zero-hour pollutant emission factor with the product of the deterioration rate and cumulative hours and multiplying by the pollutant-specific fuel correction factor. Model year specific gasoline-fueled emission factor constants were provided by AQMD. Model year specific diesel-fueled emission factor constants were referenced from CARB's 2017 Off-road Diesel Emission Factors for diesel-fueled equipment.⁵

The cumulative hours of operation for each unit were calculated by multiplying the equipment age (taken as the difference between the inventory year and engine model year ("MY")) by the annual equipment usage. Annual equipment usage hours were calculated for 2025 using activity data from the OFFROAD2017 database.

Cumulative hours of operation were capped according to guidance transmitted by the AQMD on August 13, 2021, as summarized below engine displacement information for GSE was not provided by the GSE owner/operator, therefore deterioration caps for gasoline-fueled GSE were determined solely based on model year.

Diesel GSE

25-50 horsepower ("HP"), use deterioration rate ("DR") cap of 5,000 hours
>50 HP, use DR cap of 12,000 hours

Gasoline and Liquified Petroleum Gas GSE

25-50 HP and <1 liter ("L"), use DR cap of 2,000 hours
>1L, for MY2007+, use 10,000 hours
>1L, for MY2007 and earlier, use 7,000 hours

The Method A emission factor methodology provides emission factors for hydrocarbon (HC) emissions. HC emission factors were converted to ROG emission factors by multiplying by a ROG to HC ratio of 0.9198 for gasoline-fueled units and 1.21 for

⁵ 2017 Off-road Diesel Emission Factors. CARB. Available at: https://ww2.arb.ca.gov/sites/default/files/2023-06/ordas_ef_fcf_2017_v8.xlsx. Accessed: May 2026.

diesel-fueled units, both derived from OFFROAD2017 for the airport ground support equipment sector.

Additional Calculation Assumptions

The calculation methodology required additional assumptions as summarized in the following bullet points.

- Emission factors and deterioration rates for gasoline-fueled equipment were provided up to a maximum HP bin of 300 HP. Emissions calculated for gasoline-fueled equipment operating at greater than 300 HP were calculated using the 300 HP bin values.
- Zero-hour emission factors and deterioration rates for the 50 HP bin were provided for three different engine displacements for 50 HP engines. Since engine displacement information was not provided for GSE at JWA, the maximum emission factor and deterioration rate was assumed between the three 50 HP constants.

Multiple fuel correction factors were provided for gasoline-fueled equipment. In the situation where multiple fuel correction factors applied, the newest (topmost) factor in the CARB lookup table was selected.

Emission Factor Methodology – Method B

Model year-specific emission factors were derived from the OFFROAD2017 database for each equipment type, HP bin, and fuel type operating in Orange County in 2025. Where an exact model year and HP bin match did not exist for calendar year 2025, previous calendar years were reviewed for an exact model year and HP bin match. Where an exact model year and/or HP bin match did not exist for any calendar year in OFFROAD2017, an alternate model year/HP bin combination was selected to look up emission factors. The alternate model year and HP bin were selected based on the combination that would most accurately represent the specific equipment. Lastly, the selected OFFROAD2017 emission factor was compared against the NO_x emission factor reported in the first year the specific unit was reported. If the percentage difference for the same GSE is greater than or equal to 25%, the first reporting year emission factor was used. Additional details on this methodology can be referenced in South Coast AQMD's Methodology for Calculating Ground Support Equipment Fleet Average Emission Factor documentation.⁶ Default load factors from CARB were used for all equipment.

An emission factor of zero was used for electric vehicles. Additionally, equipment that did not meet the criteria for GSE as specified in the MOU were not included in the fleet-average emission factor calculation. Some examples of equipment that do not meet MOU GSE criteria include gasoline vehicles licensed by the California Department

⁶ South Coast AQMD Airport MOUs Methodology for Calculating Ground Support Equipment Fleet Average Emission Factor. November 2024. Available at: <https://www.aqmd.gov/docs/default-source/planning/fbmsm-docs/methodology-for-calculating-ground-support-equipment-fleet-average-emission-factor.pdf?sfvrsn=6>. Accessed: May 2026.

of Motor Vehicles (“DMV”) for on-road usage,⁷ gasoline equipment with a rating less than 25 brake horsepower,⁸ and diesel equipment used for fewer than 200 hours per year which are exempt as part of a low-usage exemption.⁹ Emission factors for LPG fueled equipment were assumed to be equal to gasoline emission factors derived from OFFROAD2017.

Progress Update

The fleet averaged NOx emission factor for commercial GSE at JWA at the end of 2025 was 1.69 g/bhp-hr using Method B, which is 57.7% lower than the 2017 Baseline fleet averaged NOx emission factor of 4.0 g/bhp-hr. The GSE fleet-average emission factor is below the 2023 target of 1.7 g/bhp-hr. In 2026, JWA has and will continue to engage in consistent and clear communication with operators to identify older combustion units that operators should target for upcoming replacements. In particular, the highest priority units include Tier 0 and Tier 1 diesel engines, and older gasoline engines (i.e., any units with pre-2000 model years). JWA will continue to work with operators to move toward higher Tier or electric replacements for these retired (or moved out of state) units, as feasible.

Electrical service is provided on the airside of the commercial ramp along the gates. This electrical service has been used to operate electric chargers for the GSE. However, since Terminals A and B were installed in the early 1990s, the original infrastructure was not designed or capable of handling the significant increase in necessary electrical supply for modern GSE chargers. In order to accommodate the GSE charger electrical needs JWA has initiated two major projects to upgrade these systems. Once the systems are upgraded, the modern chargers can be installed. The project consists of two phases.

Phase 1 was completed in late 2025, which included the electrical service upgrades at four gates. These gates were selected for Phase 1 because they currently have the power needed to facilitate the operation of new chargers and only needed upgrades to ancillary services (i.e., panels and wiring). In addition, they are located where some of the highest emission units are used which allows for the transition of high emitting GSE to electric alternatives. In 2026 Airlines continue to install new chargers at these gates.

⁷ The CARB LSI regulation's definition for airport GSE does not include those categories of GSE equipment that are designated and licensed for on-road use. These pieces of equipment are not subject to the requirements of the LSI regulation. Available at: <https://ww2.arb.ca.gov/sites/default/files/classic/msprog/offroad/orspark/faqs/lsifaqagse.pdf>. Accessed: June 2026.

⁸ The CARB LSI regulation's definition for airport GSE does not include those categories of GSE equipment that are less than 25 horsepower, per California Code of Regulations (“CCR”) § 2775 (a)(1). Available at: <https://ww2.arb.ca.gov/sites/default/files/classic/msprog/offroad/orspark/largesparkappa-clean.pdf>. Accessed: June 2026.

⁹ The CARB ORD regulation exempts permanent and year-by-year low-use vehicles as defined in CCR § 2449 (e)(7). Available at: <https://ww2.arb.ca.gov/sites/default/files/2019-03/finalregorder-dec2011.pdf>. Accessed: June 2026.

Phase 1 was limited to select areas due to limitations of existing electrical supply systems at all terminals and gates.

Phase 2 installations and upgrades will include all remaining gates as well as the Commuter Gates (Gates 1 and 22) and the Cargo Area. Phase 2 will coincide with major upgrades to the electrical supply to the terminals, which will provide the additional electrical power needed at the remaining gates. The major upgrades to the electrical feed system to the terminals are currently in the construction phase, with expected completion within a year. Phase 2 is currently in the design phase, with expected completion a year after completion of the electrical upgrades (approximately June 2028). During the interim, the Airport will remain in communication with airlines and third party GSE operators to encourage increased use of existing chargers (where possible), and replacement of older tier engines with newer tier engines (or cleaner alternative fuel GSE).

MOU Schedule No. 2 – Jet Fuel Delivery Trucks

MOU Schedule No. 2 is a measure for commercial passenger airline jet fuel delivery trucks. The measure requires that the Airport install a jet fuel pipeline by the end of 2019 and eliminate routine commercial aviation jet fuel delivery trucks by January 1, 2023.

A summary of required data per the MOU is provided in **Table 5**. As required in MOU Schedule No. 2, Section III.B, information on jet fuel delivery is summarized in **Table 6** and **Table 7**. **Table 6** contains information on monthly jet fuel receipts via truck delivery and pipeline. **Table 7a and Table 7b** show the total number of routine and non-routine truck trips delivering jet fuel for commercial passenger aviation and vehicle model years (as available), an estimate of total vehicle miles traveled and an emission inventory for the jet fuel delivery trucks. In 2025 there were no routine truck trips delivering commercial jet fuel.

Calculation Methodology

The jet fuel delivery truck exhaust emissions for 2025 are calculated based on the number of delivery trips that occurred in 2025, the trip distance traveled by the delivery trucks, and emission factors from EMFAC2017. The number of annual truck trips in 2025 were provided by the two commercial jet fuel suppliers at JWA: the Commercial Fuel Farm and a Fixed Base Operator (“FBO”) servicing one commercial service airline. There were no Commercial Fuel Farm truck trips in 2025. The total number of truck trips provided by the FBO were apportioned to reflect the truck trips attributable to the commercial operations based on the fraction of monthly fuel volume received by the FBO that was sold to the commercial operator. A supplier-specific trip distance of 30 miles/trip was used for the FBO. Fleet-averaged exhaust emission factors for ROG and NO_x were obtained from EMFAC2017 for Heavy-Heavy Duty Trucks (“HHDT”) in Orange County in 2025. The fuel supplier provided details on the supply truck model year and the fuel pickup location, therefore, the fleet averaged emission factors were obtained from EMFAC2017 by calculating the emission factor for the specified model

year and the miles traveled in the calendar year 2025. Otherwise, a fleet-average was used for all HHDT vehicles in 2025.

Progress Update

The jet fuel pipeline was installed and began operation in October 2019, and all routine jet fuel truck deliveries were replaced with pipeline fuel delivery, except for occasional pipeline interruptions or breakdowns. In 2025 there were no pipeline interruptions and thus no truck deliveries to the Commercial Fuel Farm.

During the first 3 months of 2025, an existing contract with a fixed based operator serving a commercial service airline received fuel delivery via tanker truck in addition to pipeline fuel delivery. In approximately March 2025 the location of the commercial service airline changed locations as well as fueling management so that all remaining fuel deliveries in 2025 were accomplished via the pipeline.

JWA has worked with third parties to develop a fuel delivery tracking system for delivery of fuel by pipeline as well as by tanker truck. The third parties have agreed to a tracking system which consists of recordkeeping forms that are completed and submitted to JWA. These records form the basis of the data and inventory supplied as part of the 2025 MOU progress update. JWA continues to perform a quality assurance review of the information received.

MOU Schedule No. 3 – Parking Shuttle Bus Electrification

MOU Schedule No. 3 is a measure for shuttle bus (for airport employee and passenger parking lots) electrification. Under this measure, the Airport will replace a minimum of 50% and 80% of Airport employee and passenger remote parking compressed natural gas shuttle buses with battery-electric shuttle buses by January 1, 2023, and 2031, respectively. The Airport may continue to reserve non-battery-electric shuttle buses for standby and emergency use.

As stated in MOU Schedule No. 3, Section III.B.1 and III.B.3, an inventory of shuttle buses operating at JWA and shuttle buses operating at JWA during the reported year is provided in **Table 8**. An annual emissions inventory for shuttle buses including methodology and calculations, as required by MOU Schedule No. 3, Section III.B.2, is provided in **Table 9**.

Calculation Methodology

On-road emission factors for exhaust, idling, and starting ROG and NO_x, as well as evaporative ROG from hot soak, running losses, resting losses, and diurnal losses were obtained from EMFAC2017 based on vehicle model year, vehicle category and fuel type in Orange County for each scenario's calendar year. The vehicle model years for the shuttle bus fleet vehicles operating in 2025 are 2013 (2 buses), 2017 (3 buses), and 2018 (3 buses). Exhaust emission factors were calculated using a weighted average of the emission factors from each model year and using the 25 miles per hour (mph) speed bin in EMFAC as an average speed representation for the predominant travel

route. Average daily emissions were calculated assuming operation for 365 days in a year.

Progress Update

In 2025, JWA operated six shuttle buses for daily routine shuttle service with additional buses reserved for standby, emergencies or for rotation. The Airport had available four to eight buses (throughout the year) fueled by compressed natural gas and five electric buses.

In 2025, JWA installed and commissioned a mobile charger, allowing limited onsite charging of the electric buses. A proposed permanent fast charger system is currently in the permitting phase and expected to be installed and operational in 2027.

Although there is charging available for the electric buses, the buses have been mostly inoperable due to a range of issues including mechanical and electronic failure to computer system update problems. The original electric bus manufacturer (Proterra) declared bankruptcy in 2023. Phoenix Motors assumed control of the bus division out of bankruptcy. In 2025 Phoenix Motors filed for bankruptcy and stopped servicing and providing parts for the buses. JWA has hired three different bus maintenance contractors in an attempt to maintain the buses. However, after significant on-going expenditures, none have been successful in maintaining the buses for normal use operation.

As of the end of 2025, routine shuttle service was being provided by up to six of nine operational buses on-site - eight CNG and one electric - with preference for the electric bus to operate as much as possible. JWA is continuing to hire and fund maintenance contractors in an attempt to resume electric shuttle bus operations. Until such time as the electric buses can be made operational, standard CNG buses, using renewable natural gas, are being employed to support shuttle operations.

Data Attachments

Additional supporting information for the development of the emissions inventory for each measure can be found in the calculation Excel™ spreadsheets, which have been provided separately. The spreadsheet file names are as follows.

- CY2025 GSE Inventory Workbook_For Submittal to AQMD
- CY2025 Fuel Truck Workbook_For Submittal to AQMD
- CY2025 Shuttle Bus Emissions Workbook_For Submittal to AQMD
- CY2024-2025 GSE Inventory Comparison Table_For Submittal to AQMD.

Please feel free to call Melinda McCoy at (949) 252-5267, with questions or concerns regarding this report.

Sincerely,

A handwritten signature in blue ink that reads "Melinda McCoy". The signature is written in a cursive style with a large "M" and "C".

Melinda McCoy, PG
Environmental Resources Manager

Attachments

cc: Melissa Gamoning, Program Supervisor (AQMD)
Charlene Reynolds, Airport Director (John Wayne Airport)