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Prepared for
John Wayne Airport
Orange County, California

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Date
September 2019

AIR QUALITY IMPROVEMENT PLAN

JOHN WAYNE AIRPORT
ORANGE COUNTY, CALIFORNIA

RAMBOLL

CONTENTS

TABLES

TABLES *(CONTINUED)*

FIGURES

ACRONYMS AND ABBREVIATIONS

Acronym	Definition
ADDs	Average Daily Departures
AQIP	Air Quality Improvement Plan
AQMD	Air Quality Management District
AQMP	Air Quality Management Plan
BAU	Business-As-Usual
CARB	California Air Resources Board
CNG	compressed natural gas
CY	Calendar Year
EFs	Emission Factor
EIR	Environmental Impact Report
EMFAC	EMission FACtors model
EPA	Environmental Protection Agency
EV	Electric vehicle
FAA	Federal Aviation Administration
FAEL	fleet average emission levels
GPUs	ground power units
GSE	ground support equipment
HHDT	heavy heavy-duty trucks
JWA	John Wayne Airport
LAX	Los Angeles Airport
LDT1/2	Light-duty truck
LSI	large spark-ignition
MHDT	medium heavy-duty trucks
MOU	Memorandum of Understanding
NOx	oxides of nitrogen
OCTA	Orange County Transit Authority
PM	particulate matter
PM10	particulate matter smaller than 10 microns in diameter
PM2.5	Particulate matter smaller than 2.5 microns in diameter
ROG	reactive organic gas

ACRONYMS AND ABBREVIATIONS

SCAB	South Coast Air Basin
SCAQMD	South Coast Air Quality Management District
SIP	State Implementation Plan
SNA	John Wayne Airport, Orange County
SULEV	super ultralow emission
TNCs	Transportation Network Companies
ULEV	ultralow-emission
USEPA	United States Environmental Protection Agency
VDECS	Verified Diesel Emission Control Strategies
VMT	Vehicle Miles Traveled
ZEV	Zero Emission Vehicles

1. INTRODUCTION

John Wayne Airport, Orange County (SNA) (JWA or Airport), has developed this voluntary Air Quality Improvement Plan (AQIP or Plan) as part of a collaborative effort with the South Coast Air Quality Management District (SCAQMD) and other airports in the South Coast Air Basin (SCAB or Basin) (i.e., Long Beach Airport, Ontario International Airport, Hollywood Burbank Airport, and Los Angeles International Airport, collectively Basin airports) to minimize and reduce air emissions related to mobile source activities at the Airport. This AQIP was developed specifically as it relates to AQMD Measure MOB-04 from the 2016 Air Quality Management Plan (2016 AQMP). MOB-04 is a measure proposed in the 2016 AQMP to address mobile emissions from airports. The AQIP is a separate effort relative to other JWA programs to address air quality and related issues.

1.1 2016 AQMP Background

The 2016 AQMP is the SCAQMD's regional blueprint for achieving federal air quality standards in the Basin. The 2016 AQMP provides an analysis of existing and potential regulatory control options for the Basin and seeks to achieve multiple goals in partnership with other entities to reduce greenhouse gases and toxic risk, as well as provide efficiencies in energy use, transportation, and goods movement in a cost-effective manner. The 2016 AQMP demonstrates how and when the Basin will attain the ozone and Particulate matter smaller than 2.5 microns in diameter ($PM_{2.5}$) standards within the latest statutory attainment date.[1] The 1997 8-hour ozone attainment date is 2023 and the 2008 8-hour ozone attainment date is 2031.

The 2016 AQMP specifically identifies various measures to reduce nitrogen oxides (NOx) and reactive organic gases (ROG; also referred as volatile organic compound (VOC)) emissions to achieve regional attainment. One of those measures requires Basin airports to reduce non-aircraft emission sources at their facilities (i.e., *Facility-Based Measure for Mobile Sources Measure (MOB-04) for the Emissions Reductions at Commercial Airports*). MOB-04, which was included in the final 2016 AQMP approved in March 2017, was approved by the SCAQMD on April 7, 2017.[2] The California Air Resources Board (CARB) approved the 2016 AQMP on March 23, 2017,[3] and as stated in the staff report, the 2016 AQMP addressed the facility based mobile source control measures including MOB-04.[4] As further described below, the workshops and public outreach resulted in the SCAQMD shifting to a Memorandum of Understanding approach to address the emission reduction objective of MOB-04.

1.2 Workshops and Public Outreach

In response to the Board approval and direction of the facility based mobile source control measures (notably MOB-04), the SCAQMD held a series of working group meetings. The

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[1] AQMD, 2016. Available at: https://www.aqmd.gov/docs/default-source/clean-air-plans/air-quality-management-plans/2016-air-quality-management-plan/final-2016-aqmp/executive-summary.pdf?sfvrsn=4. Accessed: June 2019.

[2] AQMD, 2017. Governing Board Hearing. March 3. Available at: http://www.aqmd.gov/docs/default-source/Agendas/Governing-Board/2017/2017-apr7-001.pdf?sfvrsn=4. Accessed: June 2019.

[3] CARB, 2017. Available at: https://www.arb.ca.gov/planning/sip/planarea/scabsip/res17-8.pdf. Accessed: June 2019.

[4] CARB, 2017. Available at: https://www.arb.ca.gov/planning/sip/planarea/scabsip/2016AQMP_ARBstaffreport.pdf. Accessed: June 2019.

meetings were noticed and open to the public. The first introductory meeting for all facility based mobile source control measures occurred on May 8, 2017. More than 100 stakeholders, including representatives from industry, government, environmental, and community groups participated in the first working group meeting. The first MOB-04 Working Group meeting was held on May 31, 2017, where the SCAQMD presented MOB-04, including the background, working group process, metrics used to evaluate progress, measure development framework, emission sources, existing and future regulations, State Implementation Plan (SIP) credit requirements, example emission reduction opportunities, technologies currently available, and stakeholder input. There were a total of five open public meetings during the evaluation of MOB-04 culminating on February 1, 2018.[5] In the fifth MOB-04 working group meeting, the SCAQMD presented staff's recommendation that the Governing Board pursue a Memorandum of Understanding ("MOU") approach with the airports to implement MOB-04. The Governing Board approved this approach in June 2018.[6] Specifically, the Governing Board moved to "direct staff to pursue the approach for developing facility-based emission reduction strategies for commercial airports through voluntary measures only." JWA participated in the public meetings and working group meetings in this initial MOB-04 process.

Consistent with MOB-04, JWA has engaged in a collaborative process with the SCAQMD, Airlines for America ("A4A"), airlines not part of A4A, and Basin airports to develop an AQIP and an MOU with the SCAQMD for implementation of the AQIP. As part of this process, JWA has been involved in discussions with the SCAQMD and Basin airports in order to evaluate and identity possible initiatives and measures to achieve emission reductions consistent with the requirements of MOB-04. The SCAQMD has scheduled four working group meetings as part of the public outreach process in the development of the MOU and AQIP. On February 28, 2019, the first Airport MOU Working Group was held. At this meeting, the SCAQMD presented an update on the MOU approach and the Basin airports provided a brief summary of the framework they would follow to implement MOB-04, including the development of AQIPs for each Basin airport with initiatives and measures to reduce emissions from non-aircraft mobile sources related to the airport.

The County of Orange Board of Supervisors will review and approve the AQIP during a public meeting after notice is given in accordance with the Brown Act. The public notice will specify the date of the Board of Supervisors meeting and will include the AQIP and other relevant documents. JWA will take into account the discussions with the SCAQMD, Basin airports, A4A and airlines, and other stakeholders in preparing the final draft AQIP for consideration and approval. The JWA Airport Commission will review and make a recommendation to the Orange County Board of Supervisors regarding the draft final AQIP. Staff will prepare a final agenda staff report (ASR) for Board consideration with final recommendations based on recommendations and input received from the Airport Commission and other stakeholders, and the Board will make a final determination regarding approval of the AQIP.

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[5] AQMD, 2019. Available at: https://www.aqmd.gov/home/air-quality/clean-air-plans/air-quality-mgt-plan/facility-based-mobile-source-measures/fbmsm-mtngs. Accessed: June 2019.

[6] AQMD, 2019. Available at: http://www.aqmd.gov/docs/default-source/Agendas/Governing-Board/2018/2018-jun1-001.pdf?sfvrsn=8. Accessed: June 2019.

1.3 Airport Mobile Source Inventory Overview

The AQIP includes emissions inventory information for sources for which there are initiatives or measures, consistent with the boundaries of MOB-04, which addresses non-aircraft mobile sources. The mobile sources related to the Airport can be categorized into two primary categories: 1) those related to operations which are directly controlled by JWA (*i.e*., through ownership) or 2) those related to operations that are only indirectly influenced by JWA (*e.g*., through contract or permit mechanisms, airport design, etc.). The mobile sources related to the Airport can also be separated between sources related to commercial and general aviation operations. This AQIP only pertains to mobile sources related to commercial operations consistent with MOB-04. And thus, mobile sources related to general aviation operations are not included this AQIP. Furthermore, and as indicated in MOB-04, the emissions related to aircraft and aircraft operations/systems (e.g., the auxiliary power unit) are excluded from this AQIP.

The emergency and rescue vehicles operated by local, state and federal enforcement agencies are also excluded from this AQIP analysis. Emergency and rescue vehicles include those necessary to respond to situations where potential threats to life or property exist, such as those operated by police and sheriff departments, fire department, hospital, medical and paramedics. While JWA provides space for these operations/vehicles, these operations are controlled by other local, state or federal jurisdictions and the functional performance for safety are the priority criteria.

The following list of mobile sources are included in the inventory that has been evaluated as part of this AQIP. These mobile sources consist of vehicles owned and operated by JWA, and those which JWA can indirectly influence (e.g., tenants, vendors, concessionaires, and the general public).

Direct Control

- Vehicles owned and operated by JWA
  - Fleet (including licensed on-road vehicles and unlicensed vehicles and equipment)
  - Parking Shuttles for employees and passengers (contracted fleet)

Not Under Direct Control

- Vehicles owned/contracted by airlines
  - Ground support equipment (GSE) and fuel trucks
- Permit vehicles (vehicles issued a permit to operate at JWA, but not owned or operated by JWA)
  - Rental cars
  - Taxi cabs and limousines
  - Delivery and catering
  - Concessionaires
  - Transportation network companies (TNCs)
- Personal vehicles owned by passengers, tenants and concessionaires
- Personal vehicles owned and operated by JWA employees

- Construction vehicles

These sources are further described in **Section 3** and **Section 4** of this AQIP.

The emissions inventory for these sources parallels the attainment demonstration years for the ozone standard and evaluates a baseline year consistent with the request by the SCAQMD. The baseline year in the AQIP is 2017, and the future years evaluated in the AQIP are 2023 and 2031, which are the demonstration attainment years that the SCAQMD must evaluate in the AQMP. For the future year emission inventories in 2023 and 2031, the Airport has developed both a Business-As-Usual (BAU) emissions inventory (developed to represent the scenario if no further actions were taken by JWA beyond the regulations that already exist as assumed in the AQMP) and an emissions inventory with implementation of the measures provided in the AQIP (developed to calculate the anticipated emissions reduction in 2023 and 2031). This is done per the request of the SCAQMD to facilitate SCAQMD evaluation relative to the AQMP.

The Airport emissions inventory is illustrated in Figure 1. This figure shows the distribution of NOx emissions sources related to the Airport as was reported for the Airport in Environmental Impact Report 617 (EIR 617). The mobile emissions included all of the categories except the one titled "stationary sources." Notably, the Airport only has direct control over the "JWA owned equipment" category, which accounts for approximately 0.1% of the NOx emissions. The MOU and AQIP evaluate the "on-road licensed vehicles," "JWA owned equipment," and "GSE." As discussed above, "aircraft" emissions are not covered as part of the MOU and AQIP.

JWA is exploring other non-mobile source projects that are expected to have co-benefits to reducing mobile source related emissions. JWA is developing a program to install solar panels at the Airport, and provide energy storage using a battery system. The energy will be integrated into the existing energy grid to reduce the load for the on-site cogeneration plant, especially during peak energy usage hours. The generation of energy by solar and energy storage will reduce on-site emissions from the on-site cogeneration power plant. In conjunction with JWA efforts to provide EV chargers, this clean power will help reduce mobile source related emissions by providing renewable energy to the EV chargers.

Other non-mobile source projects being implemented include:

- Battery/solar microgrid
- LED replacement lighting
- Cool roofs and window shading
- Energy efficient equipment replacement including variable speed drive upgrades
- Recycling and food waste diversion
- Water conservation

1.4 Air Quality Improvement Plan

To Be Completed as MOU framework is worked out with AQMD.

1.5 Memorandum of Understanding

To Be Completed as MOU framework is worked out with AQMD.

2. REGULATORY BACKGROUND

2.1 Existing Mobile Source Regulations

There are both existing and proposed rules and regulations that could impact mobile sources related to airport activities. The following provides the regulatory background of the existing and proposed rules and regulations that were evaluated to assist in the development of the baseline and forecast emission inventories for the AQIP.

2.1.1 SCAQMD Light-, Medium-, and Heavy-Duty Fleet Rules

The SCAQMD has various rules that are applicable to vehicle emission sources at airports. For example, Rule 1191, *Clean On-Road Light- and Medium-Duty Public Fleet Vehicles,* controls vehicle emissions by requiring certain fleets operating in the SCAB to utilize lower emitting vehicles. [7] This rule applies to fleets operated by government agencies (including special districts like water, air, sanitation, school, etc.) with 15 or more non-exempt light- and medium-duty on-road gasoline, diesel, and alternative fueled vehicles. It requires applicable fleets operating within the SCAB (including those owned by or servicing JWA) to acquire low-emitting gasoline or alternative fuel vehicles beginning in July 1, 2001. Similarly, Rule 1196, *Clean On-Road Heavy-Duty Public Fleet Vehicles*, is regulation with the same requirements that applies to fleets of on-road heavy-duty gasoline, diesel, and alternative fueled vehicles.[8] Both rules include similar exemptions for certain fleets, such as those used for emergency response or law enforcement.

Airport vendors must also comply with Rule 1194, *Commercial Airport Ground Access*, which requires all public and private fleets providing passenger transportation services out of commercial airports operating in the SCAQMD to acquire cleaner burning or alternative-fueled vehicles.[9] This rule applies to passenger cars, light-duty trucks, and medium- and heavy-duty transit vehicle fleets of 15 or more vehicles. Contracted passenger shuttle buses and taxi cabs serving airports must comply with this rule, as well as shuttles and other fleet operations not contracted by airports.

2.1.2 CARB In-Use Off-Road Diesel-Fueled Fleets Regulation

CARB currently requires emission reductions for certain classes and ages of off-road diesel fueled fleet vehicles via the statewide In-Use Off-Road Diesel-Fueled Fleets Regulation.[10] It applies to all off-road diesel vehicles 25 horsepower or greater and most two-engine vehicles, with exemptions for certain vehicles such as those used solely for agriculture and those for personal use. The regulation requires applicable vehicles to register with CARB and restricts certain practices like idling and adding older vehicles to fleets. The regulation also requires fleets to reduce emissions by retiring, replacing, or repowering older engines or installing Verified Diesel Emission Control Strategies (VDECS).

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[7] SCAQMD. 2000. Rule 1191 – Clean On-Road Light- and Medium-Duty Public Fleet Vehicles. Available at: https://www.aqmd.gov/docs/default-source/rule-book/reg-xi/rule-1191.pdf?sfvrsn=4. Accessed: May 2019.

[8] SCAQMD. 2008. Rule 1196 – Clean On-Road Heavy-Duty Public Fleet Vehicles. Available at: https://www.aqmd.gov/docs/default-source/rule-book/reg-xi/rule-1196.pdf?sfvrsn=6. Accessed: May 2019.

[9] SCAQMD. 2000. Rule 1194 – Commercial Airport Ground Access. Available at: https://www.aqmd.gov/docs/default-source/rule-book/reg-xi/rule-1194.pdf?sfvrsn=4. Accessed: May 2019.

[10] CARB. 2019. In-Use Off-Road Diesel-Fueled Fleets Regulation. Available at: https://www.arb.ca.gov/msprog/ordiesel/ordiesel.htm. Accessed: May 2019.

2.1.3 CARB On-Road Heavy-Duty Diesel Vehicles (In-Use) Regulation

CARB currently requires emission controls for diesel trucks and buses via the statewide On-Road Heavy-Duty Diesel Vehicles (In-Use) Regulation.[11] It requires applicable heavy-duty vehicles to be upgraded to meet emissions standards for criteria pollutants. These upgrades involve the installation of more efficient particulate filters or complete replacement of the vehicle or engine. This replacement has been occurring on a tiered schedule that started in 2015. By 2023, nearly all trucks and buses will be required to have model year 2010 engines (or equivalent) or newer. The compliance schedule for vehicle replacement is based on factors like the existing engine model year, type of vehicle (e.g., school bus, drayage truck), and gross vehicle weight. Thus, depending on these factors, certain heavy-duty vehicles operating at JWA may already be subject to the regulation, with the remaining requiring compliance by 2023. Exemptions to this regulation include emergency response vehicles, low-weight trucks for personal use, and vehicles subject to certain other sections of the California Code of Regulations.

2.1.4 CARB Large Spark-Ignition Engine Fleet Requirements Regulation

CARB currently regulates emissions from certain vehicle types having large spark-ignition (LSI) engines via the LSI Engine Fleet Requirements Regulation.[12] This regulation applies to off-road LSI engine forklifts, sweepers/scrubbers, industrial tow tractors, and airport GSE operated for business purposes within the State of California. Additionally, it applies only to vehicles with engines of at least 25 horsepower (hp) and 1.0 liter displacement that are part of fleets of four vehicles or more. The regulation requires that applicable fleets achieve specific fleet average emission levels (FAELs) for hydrocarbons and NO_X. These standards became more stringent over time until reaching the lowest regulated FAEL in 2013.

2.1.5 CARB Zero-Emission Airport Shuttle

CARB has approved a regulation to accelerate the deployment of zero-emission airport shuttle fleets at large, medium, and small hub airports. The rule promotes the development and use of zero-emission ground transportation to and from airports around California. This will help CARB achieve the emission reduction strategies included in the State's Mobile Source Strategy, State Implementation Plan, and Sustainable Freight Action Plan. According to information from CARB, this initiative will work in combination with the existing SCAQMD airport commercial transportation rules for shuttles. The Zero-Emission Airport Shuttle Regulation would require the following percentages of airport shuttle fleets to be zero-emission vehicles (battery electric or fuel cell): 33 percent by the end of 2027, 66 percent by the end of 2031, and 100 percent by the end of 2035.[13]

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[11] California Code of Regulations. 2014. Regulation to Reduce Emissions of Diesel Particulate Matter, Oxides of Nitrogen and Other Criteria Pollutants from In-Use Heavy-Duty Diesel-Fueled Vehicles. Available at: https://www.arb.ca.gov/msprog/onrdiesel/onrdiesel.htm. Accessed: May 2019.

[12] California Code of Regulations. 2016. Large Spark-Ignition (LSI) Engine Fleet Requirements Regulation. Available at: https://ww3.arb.ca.gov/msprog/offroad/orspark/largesparkappa-clean.pdf. Accessed: May 2019.

[13] CARB. 2018. Proposed Regulation Order for the Proposed Zero-Emission Airport Shuttle Regulation. Available at: https://www.arb.ca.gov/regact/2019/asb/appa.pdf?_ga=2.255035912.1469842448.1555030954-893091953.1554304459. Accessed: April 2019.

2.2 Future Mobile Source Regulations

2.2.1 CARB Zero-Emission Airport Ground Support Equipment

CARB is currently in the process of developing a zero-emission initiative for GSE at airports around California.[14] GSE is utilized for various functions at airports such as refueling aircraft, transporting cargo and passengers to and from aircraft, and providing maintenance. This new regulation would help CARB achieve the emission reduction strategies included in the State's Mobile Source Strategy, State Implementation Plan, and Sustainable Freight Action Plan. This rule is intended to advance GSE conversion to zero-emission (i.e., electric) technologies while accelerating the goals and requirements provided in the LSI Engine Fleet Requirements Regulation.[15] The rule will apply to the tenant airlines at JWA and their contractors of GSE.

[14] CARB. Zero-Emission Airport Ground Support Equipment. Available at: https://ww2.arb.ca.gov/our-work/programs/zero-emission-airport-ground-support-equipment/about. Accessed: May 2019.

[15] CARB. 2016. Final Regulation Order – Large Spark-Ignition (LSI) Engine Fleet Requirements Regulation. Available at: https://ww3.arb.ca.gov/msprog/offroad/orspark/largesparkappa-clean.pdf. Accessed: May 2019.

3. INITIATIVES AND MEASURES

3.1 Mobile Sources

JWA has developed and included in this AQIP both initiatives and measures to meet the goals of MOB-04. Measures are those programs, policies and procedures which JWA is voluntarily implementing that are anticipated to result in emission reductions. Initiatives are those programs, policies, and procedures which JWA is voluntarily pursuing; however, it is less certain what emission reductions are achievable from these voluntary initiative efforts.

3.1.1 Measure 1: GSE

Background

Commercial airline tenants or contractors operate GSE as part of their airside operations. For purposes of this AQIP, GSE is defined as off-road equipment used to support aircraft operations and includes, tugs, ground power units (GPUs), and loaders.[16] Each tenant at JWA operates a unique GSE fleet depending on the scale and nature of their operations. A GSE operator's "Airport GSE fleet" is comprised solely of GSE operated at JWA.

To encourage tenants to continue to electrify GSE, JWA has installed an EV charging infrastructure system. All commercial gates have Level 2 EV chargers that meet current GSE charging needs, and the airport is able to address future charging demand through additional infrastructure development.

Measure 1

> JWA will require an airport GSE fleet-wide average NOx emissions factor equal to or less than [1.7] g/bhp-hr by January 1, 2023 and [0.9] g/bhp-hr by January 1, 2031.*
> *FIGURES IN BRACKETS ARE PRELIMINARY, SUBJECT TO REFINEMENT PER FURTHER TECHNICAL WORK AND CONSULTATION WITH STAKEHOLDERS

The reduced average emission factor can be met using a combination of approaches including, but not limited to, replacing or repowering old equipment with newer, cleaner engines, replacing traditional-fueled equipment with alternative fuel equipment, and replacing equipment with combustion engines with electric or other zero-emission technology. Upon achieving the 2023 and 2031 Emissions Targets, each GSE operator shall be required to ensure its fleet average continues to meet these targets.

JWA recognizes that successful electrification of GSE at the airport depends on: (1) adequate, reliable power generating capacity; (2) adequate, reliable on-AIRPORT infrastructure to deliver electric power to GSE (e.g., substations, conduits and chargers); and (3) the commercial availability of reliable electric GSE on the market at reasonable prices that is capable of performing the tasks required of it at JWA safely, reliably and efficiently. Parallel requirements condition the deployment of other types of

[16] 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.

alternatively-fueled vehicles. JWA understands that the GSE fleet data provided by airlines and third parties may incorporate (1) low-use exceptions (consistent with CARB rules and regulations), (2) allowance for GSE to reach useful life of at least 12 years (consistent with the California Health and Safety Code (HSC)[17]), and (3) cost-effectiveness demonstrations regarding GSE electrification and the calculation of average NOx emissions factors will incorporate these items.

3.1.2 Measure 2: Jet Fuel Delivery Trucks

Background

The jet fuel for commercial passenger flights is currently transported via trucks to JWA. JWA has worked with tenants to implement a project to install a jet fuel pipeline to transport jet fuel for commercial passenger aviation to new airfield storage tanks to eliminate the need for the fuel trucks. This project is expected to be completed by the end of 2019.

Measure 2

> JWA will work with JWA tenants to install a fuel pipeline to eliminate the regular routine commercial passenger jet fuel delivery by trucks by January 1, 2023.

3.1.3 Measure 3: Concessions Nighttime Delivery Policy

Background

The concessions (goods) delivery to JWA has traditionally occurred throughout the day. These trucks deliver goods to various locations at JWA. During the daytime, the traffic at JWA is considerably heavier than that during the nighttime. The delivery trucks contribute to congestion for other vehicles and result in greater idling time for all vehicles. The shifting of such deliveries to nighttime will reduce idling by vehicles traveling on the roads in and around the airport.

Measure 3

> JWA will voluntarily create a policy to require concession deliveries to be performed after 11 p.m. and before 6 a.m.

3.1.4 Measure 4: JWA Owned Vehicle Clean Fleet Policy

Background

JWA maintains a fleet of vehicles for travel around the airport, travel to on- and off-site locations (e.g., for JWA employee personnel), and for maintenance operations. The vehicle fleet includes those that are licensed for public roadway travel (on-road) and those that are unlicensed (off-road). This fleet consists of automobiles, trucks, and sweepers (note that portable equipment such as pressure washers and lighting trailers are not included in this AQIP). Light- and medium-duty vehicles included in this fleet are purchased in accordance with the Orange County Fleet Services Vehicle Replacement Guide and Standard Specifications, which is an approved policy by the County of Orange Board of Supervisors. This policy provides the guidelines for replacement of vehicles based on several criteria, including mileage, age, utilization, condition, and operating costs. The policy also contains a list of approved replacement vehicles, which is guided by CARB and SCAQMD mobile source

[17] California Health and Safety Code § 43021 (Division 26 Air Resources, Part 5 Vehicular Air Pollution Control, Chapter 1)

regulations and a Buy America requirement.[18] Improving the fleet will help reduce emissions from the operation of these vehicles. JWA has reviewed the current light- and medium-duty fleet status versus this existing policy and the infrastructure demands to develop this Measure.

Measure 4

JWA will voluntarily increase the percentage of new electric, alternative fuel, or hybrid vehicles through a replacement process of existing vehicles. JWA will develop a written policy to guide the purchase of new and replacement of existing 1) on-road and licensed vehicles and 2) unlicensed vehicles and equipment larger than 50 horsepower. The policy will be subject to the annual budget constraints available to JWA for the purchase of new and replacement vehicles and equipment.

3.1.5 Measure 5: Parking Shuttle Bus Electrification

Background

JWA currently operates parking shuttle buses for passengers and airport employees (*i.e.*, JWA and tenants). The shuttle buses pick up and drop off at parking lots along Main Street and the Airport. Currently, JWA operates 12 shuttle buses daily, between the hours of 5 a.m. and 12 a.m. for passengers and 24 hours per day for airport employees. The buses are owned and operated by contracted vendors and are currently powered by compressed natural gas (CNG).

Measure 5

Replace a minimum of 50% and 80% of airport employee and passenger remote parking compressed natural gas (CNG) shuttle buses with battery-electric shuttle buses by 2023 and 2031, respectively. The airport may continue to reserve non-battery-electric shuttle buses for standby and emergency use.

3.1.6 Measure 6: Clean Construction Program

Background

Construction projects at JWA will require the use of off-road construction equipment. Requiring higher tier construction equipment and use of power supplies other than generators will reduce emissions.

Measure 6

JWA will voluntarily implement a policy to require higher tier construction equipment on construction projects. The policy is anticipated to include:

JWA will require heavy duty, off-road, diesel-powered construction equipment to meet or exceed the USEPA's Tier 4 off-road emissions engine standards during Airport construction projects in order to reduce construction-related NOx emissions. Exceptions may be allowed for unique circumstances requiring the Airport Director's approval. In addition, airport construction projects will be required to draw power from utility poles and lines, where available.

[18] The Buy America requirement establishes compliance with 49 USC § 50101.

3.1.7 Measure 7: Smart Parking Features

Background

There are mobile emissions from idling and circling vehicles in parking lots. Smart parking features can help reduce these emissions.

Measure 8

> JWA will voluntarily install smart parking features to reduce idling and circling vehicles in the parking lots. These smart parking features may include but may not be limited to 1) notification of the number of parking spaces available on each floor; 2) availability light notifications above each parking space; 3) credit card entry systems; and/or 4) pay on foot stations.

3.1.8 Measure 8: Congestion and Passenger Vehicle Reduction

Background

There are mobile emissions from idling and circling vehicles traveling around the airport loop. Infrastructure design can minimize and reduce these emissions, such as cell phone and taxi waiting lots. The cell phone waiting lot allows pick-up vehicles to wait in the lot until the passenger(s) arrive, and then proceed to the pickup point at the terminals. This reduces the trips around the airport waiting for passengers to arrive, as well as idling time. The taxi lot provides a parking and waiting area, and works in the same manner as the cell phone lot. Taxi vendor stands at the terminals allow the vendor to call the taxi lot and request a taxi, which then proceeds to the pickup area, immediately loads the passenger(s) and leaves. Again, this reduces the idling time for taxis while waiting for passengers to arrive. The Airport has previously constructed two lots (i.e., cell phone lot, completed in the 1990s and taxi parking lot, completed in 2015) to achieve these reductions.

Measure 9

> JWA voluntarily constructed two lots to reduce airport loop vehicle travel. The two lots include a cell phone waiting lot for passenger pickup, and a taxi parking/waiting lot.

3.1.9 Measure 9: TNC Vehicle Miles Traveled Reduction Policy

Background

TNCs continue to increase their share of travel to and from the Airport. JWA works with the TNCs to ensure safe and efficient service at the Airport. Three TNCs currently operate at the Airport: Uber, Lyft, and Wingz. The improvement of the TNC operation will help reduce vehicle miles traveled (VMT).

Measure 12

> JWA will collaborate with the TNCs to optimize their operation efficiency at the Airport. JWA will designate pickup/drop-off locations in the three main terminal parking structures and establish a re-matching system to allow the vehicle dropping off a passenger to pick up another passenger within 30 seconds of drop-off.

3.1.10 Initiative 1: Taxi Clean Fleet Policy

Background

JWA has implemented a requirement in the operating agreements for taxicab operators to improve their fleets by using alternative fuels or hybrid vehicles. This policy will be continued, with an emphasis on increasing the use of vehicles with the lowest emissions.

Initiative 7

JWA will include the following in taxicab operating agreements:

> "Any taxicab placed into operation at the Airport must comply with all applicable CARB, SCAQMD, and Orange County Transportation Authority (OCTA) requirements including SCAQMD Rule 1194, which requires fleet operators to acquire or lease cleaner burning passenger and medium duty vehicles (those certified by CARB as ultralow-emission [ULEV], super ultralow-emission [SULEV], or zero-emission [ZEV] vehicles) when replacing existing or purchasing new vehicles. Said vehicles shall not be more than four (4) years older than the current year model."

3.1.11 Initiative 2: Electric Vehicle Charging Infrastructure

Background

The conversion of mobile sources to electric power from traditional fossil fuel power will reduce emissions. JWA has already installed 110 EV chargers in passenger parking decks since 2013.

Initiative 10

JWA will voluntarily install EV chargers in passenger and employee parking decks to meet increasing demand. JWA will study the traffic makeup to determine the number of chargers needed.

3.1.12 Initiative 3: Passenger Transportation Mode Shifts

Background

OCTA provides bus service to and from the Airport. The service connects the Metro, Metrolink and Amtrak rail lines, and Greyhound bus depots to the Airport. It also provides local bus service to and from the Airport to neighboring cities in Orange County.

In addition to OCTA, there are on-call shuttle bus services to and from the Airport. Currently 15 different shuttle bus vendors are permitted to access the Airport. These shuttle buses provide mass transportation services locally, as well as to other airports in the region, such as Los Angeles International Airport. The presence of these services and design reduces the idling and circling of buses.

Initiative 11

JWA will continue to evaluate and support these services as provided by OCTA and other vendors. This will include the assignment of a JWA liaison with OCTA, and regular and periodic communications. JWA will focus on facilitating transit options to JWA and explore options to provide electric charging infrastructure to support transit vehicles.

3.1.13 Initiative 4: Orange County Employee Rideshare Program

Background

The County of Orange has established a ride share program for employees.[19] This includes the following programs: guaranteed ride home, carpool and vanpool match-list, train and bus start-up subsidy, commuter choice, monetary incentives for purchase and use of electric vehicles or plug-in hybrid vehicles for travel to and from work, bonus and monetary incentives for club rideshare memberships, Inland Empire commuter and rideshare programs, and OCTA vanpool lease subsidies. These programs and incentives are offered to all employees, including employees at JWA. Access for all programs is provided by web-based systems. As previously indicated, rideshare, bus and multi-passenger pickup and drop-off is provided at the dedicated vehicle transportation lot in the middle of the Airport.

Initiative 13

JWA will continue to implement the County Rideshare Program.

[19] Available at: http://www.ocgov.com/gov/hr/hrresources/rideshare. Accessed: June 2019.

4. MOBILE SOURCE EMISSIONS INVENTORY

This section describes the emissions evaluation for the initiatives and measures discussed in **Section 3**. The following categories of emissions are evaluated in this section:

1. Baseline Emissions – ROG and NO_X emissions for calendar year (CY) 2017;
2. BAU Emission Forecast – ROG and NO_X forecast emissions inventory for CY 2023 and 2031, which describes a future baseline for the AQIP. The BAU emissions inventory assumes that the airport continues to operate while incorporating changes due to growth and existing regulations. The growth factors are generally based on EIR 617. **Table 4-1** shows growth in commercial aircraft activity and passengers at JWA assumed in this AQIP. As part of the settlement agreement between JWA, the City of Newport Beach and two community groups, commercial aircraft activity at the Airport is limited to 10.8 million passengers (MAP), 11.8 and 12.2 or 12.5, for the years 2020, 2025 and 2030, respectively. The average daily departures (ADDs) for Class A aircraft at the Airport are limited to 85 ADDs in 2020 and 95 ADDs in 2025 and 2030. The analysis incorporates the assumptions on regulations as currently incorporated in EMFAC2017 and OFFROAD2017; and
3. Projected Emissions Benefit – Projected ROG and NO_X emissions reductions from the initiatives and measures, as outlined in **Section 3**, in CY 2023 and 2031.

4.1 GSE (Measure 1)

4.1.1 Baseline Emissions

GSE emissions are calculated for 2017 based on an inventory of GSE equipment at JWA provided by A4A, as well as from Delta Airlines and Frontier Airlines, which serve JWA but are not part of A4A. The A4A inventory contained information on equipment type, fuel type, engine model year and engine horsepower. Information gaps within the Delta Airlines and Frontier Airlines inventories were filled in based on typical parameters of similar equipment operating at JWA. Equipment listed as being non-motorized (e.g., baggage carts without motors, tow bars) and on-road vehicles (e.g., pickup truck, van) were excluded from the inventories provided by Delta Airlines and Frontier Airlines. **Table 4-2** shows the list of GSE assumed to be operating at JWA in baseline year 2017. The inventory provided by A4A, Delta, and Frontier did not include usage information (e.g., hours or fuel consumption).

Annual equipment usage hours were calculated for 2017 using activity data from the OFFROAD2017 database. Total annual usage hours in OFFROAD2017 for Orange County in 2017 for each type of GSE (e.g., aircraft tractor) was divided by total GSE population to calculate annual average hours of usage and assigned to each equipment of that type listed in the GSE inventory.

The OFFROAD2017 database was used to calculate exhaust ROG and NOx emissions from GSE for the baseline year. **Table 4-2** shows the emission factors and load factor used for each GSE. Each GSE was mapped to a corresponding OFFROAD2017 equipment type, as shown in **Table 4-3**. Model year-specific emission factors derived from the OFFROAD2017 database for each equipment type, horsepower bin and fuel type operating in Orange County in 2017. Default load factors from OFFROAD2017 was used for each GSE equipment type. Emission factors were multiplied by annual hours of use, load factor and horsepower for each equipment to calculate total emissions in 2017. Where an exact model year and/or horsepower bin match did not exist, the closest horsepower bin was used to look up emission factors. An emission factor of zero was used for electric vehicles. Average daily emissions were calculated assuming operation for 365 days in a year. **Table 4-2** shows the average daily exhaust ROG and NOx emissions from each GSE as well as total emissions from all GSE at JWA for the 2017 baseline year.

4.1.2 BAU Emission Forecast

The BAU emissions inventory for GSE followed a similar methodology to that used to calculate baseline emissions. GSE was aged from the baseline by increasing the model years of all equipment by an amount equal to the modeled future year (2023 or 2031) minus the baseline year (2017) such that the average fleet age remained the same as the baseline year. Annual hours of usage in 2023 and 2031 are calculated by scaling baseline hours of usage by the ratio of ADDs at JWA in 2025 and 2030, as published in EIR 617.

Emission factors were obtained from the OFFROAD2017 database by horsepower bin and the forecast engine model year in 2023 or 2031. If the database did not contain an inventory of equipment for the exact model year and horsepower bin, the closest available model year and horsepower bin was used. An emission factor of zero was used for electric vehicles. Average daily emissions were calculated assuming operation for 365 days in a year.

Table 4-4 shows the assumed model year, emission factors, load factors and average daily emissions for GSE in 2023. **Table 4-5** shows the assumed model year, emission factors, load factors and average daily emissions for GSE in 2031.

4.1.3 Projected Emissions Benefit

The emissions reductions for GSE from future-year improvements in 2023 and 2031 are calculated based on a GSE fleet that achieves the proposed fleet-average NOx emission target of approximately [1.7] g/bhp-hr in 2023 and [0.9] g/bhp-hr in 2031. **Table 4-6** shows a summary of emission reductions in the improved future years relative to BAU. From this measure, NOx emissions are expected to be reduced by [26.3] pounds (lb)/day in 2023 and [21.5] lb/day in 2031 compared to the BAU emissions inventory. ROG emissions are expected to be reduced by [3.2] lb/day in 2023 and [3.1] lb/day in 2031 compared to the BAU emissions inventory. (NOTE, NUMBERS IN BRACKETS ARE PRELIMINARY, SUBJECT TO REFINEMENT PER FURTHER TECHNICAL WORK AND CONSULTATION WITH STAKEHOLDERS.)

4.2 Jet Fuel Delivery Trucks (Measure 2)

4.2.1 Baseline Emissions

The baseline jet fuel delivery truck exhaust emissions for 2017 are calculated based on the number of delivery trips per year in 2017, an average round trip distance traveled by the delivery trucks, and emission factors from EMFAC2017. The number of annual truck trips in 2017 is calculated using historical truck trips from 2010 and 2011,[20] scaled up to 2017 using the number of annual commercial aircraft operations at JWA in 2010/2011 and 2017.[21] Average round trip distance for fuel truck trips is assumed to be 31.9 miles, based on the average miles driven by fuel delivery trucks to JWA over 2008-2011.[22] Fleet-averaged

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[20] Michael Brandman Associates, "Initial Study for John Wayne Airport New Jet Fuel Pipeline and Tank Farm", December 2013.

[21] JWA Airport Statistics. https://www.ocair.com/newsroom/news/airportstats.

[22] Michael Brandman Associates, "Initial Study for John Wayne Airport New Jet Fuel Pipeline and Tank Farm", December 2013.

exhaust emission factors for ROG and NOx were obtained from EMFAC2017 for Heavy-Heavy Duty Trucks (HHDT) in Orange County in 2017. Average daily emissions were calculated assuming operation for 365 days in a year. **Table 4-7** shows the assumptions and daily average emissions of ROG and NOx from jet fuel delivery trucks.

4.2.2 BAU Emission Forecast

The BAU emissions inventory for jet fuel delivery trucks followed the same methodology used to calculate baseline emissions. The number of annual truck trips in 2023 and 2031 is calculated by scaling baseline truck trips by the growth in ADDs between 2017 and 2023/2031. The emission factors from EMFAC2017 for 2023 and 2031 are used for this BAU emissions inventory. **Table 4-7** shows the assumptions and the daily average emissions of ROG and NOx from jet fuel delivery trucks.

4.2.3 Projected Emissions Benefit

The emission reductions from the installation of the jet fuel delivery pipeline are calculated based on the removal of the fuel delivery trucks (see **Table 4-7**). The expected emission reductions from this measure are 9.3 lbs/day of NOx in 2023 and 8.3 lb/day of NOx in 2031, and 0.1 lb/day of ROG in 2023 and 0.08 lb/day of ROG in 2031 compared to the BAU emissions inventory.

4.3 Concession Delivery Trucks (Measure 3)

4.3.1 Baseline Emissions

Exhaust emissions from concession delivery trucks for 2017 are calculated based on the number of delivery trips in 2017, an average idling duration per delivery trip, and idling emission factors from EMFAC2017. The number of annual truck trips in 2017 is calculated to be 3,237 based on a survey of concession tenants. Average idling duration per trip is assumed to be 15 minutes per trip. Fleet-averaged idling emission factors for ROG and NOx were obtained by running the EMFAC2017 project-level analysis tool for Orange County and calculating a fleet-average emission factor by weighting emission rates according to the number of trips of HHDT, Light Duty Trucks (LDT1/2), Medium-Heavy Duty Trucks (MHDT), Other Bus (OBUS) and School Bus (SBUS) vehicle categories. Average daily emissions were calculated assuming operation for 365 days in a year. **Table 4-8** shows the assumptions and daily average emissions of ROG and NOx from concession delivery trucks.

4.3.2 BAU Emission Forecast

The BAU emissions inventory for concession delivery trucks followed the same methodology as that used for the baseline emissions. The number of annual truck trips in 2023 and 2031 is calculated by scaling baseline truck trips by the growth in million annual passengers (MAP) at JWA between 2017 and 2023/2031. The emission factors from EMFAC2017 for 2023 and 2031 are used for this BAU emissions inventory. **Table 4-8** shows the assumptions and the daily average emissions of ROG and NOx from concession delivery trucks.

4.3.3 Projected Emissions Benefit

The emissions reduction from the implementation of night-time concession deliveries is calculated based on the reduced idling time. The calculation assumes that vehicle idling times in traffic are reduced from 15 minutes per trip during the day to 5 minutes per trip during the night. BAU emissions for 2023 and 2031 from concession delivery trucks are scaled according to the ratio of improved idling times and are shown in **Table 4-8**. From this measure, NOx emissions are expected to be reduced by 0.13 lb/day in 2023 and 0.11 lb/day in 2031 compared to the BAU emissions inventory. ROG emissions are expected to be reduced by 0.03 lb/day in 2023 and 0.02 lb/day in 2031 compared to the BAU emissions inventory.

4.4 JWA Owned Fleet (Measure 4)

4.4.1 Baseline Emissions

Baseline emissions from JWA's fleet of on-road and off-road vehicles for 2017 are calculated based on the inventory of vehicles owned by JWA. The inventory, shown in **Table 4-9** (on-road) and **Table 4-10** (off-road), contains year, make and model of the vehicles; fuel type; mileage in 2017 (for on-road vehicles); and horsepower (for off-road vehicles) and hours of usage per year (for off-road vehicles). For the equipment where annual mileage/hours of usage in 2017 were not known, the annual usage from 2013 as published in JWA's EIR 617 was assumed. Portable equipment (e.g., lights, pressure washers, paint strippers, etc.) and stationary equipment (e.g., sign boards, emergency generators, etc.) were not considered mobile sources and therefore are not included in this analysis. Electric vehicles were assumed to have an emission factor of zero for this analysis.

On-road emission factors for exhaust, idling and starting ROG and NOx, 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 in 2017. EMFAC is the name of a California model EMission FACtor (EMFAC) that calculates emissions for cars, trucks motorcycles, motor homes and buses. Vehicles were mapped to EMFAC categories based on gross vehicle weight. Exhaust emission factors were calculated to be the average of the emission factors at the 5 miles per hour (mph) and 10 mph speed bins in EMFAC, since the speed limit within the airside areas of JWA is 10 mph. Average daily emissions were calculated assuming operation for 365 days in a year, and each vehicle was assumed to perform one trip per day when calculating starting, running loss and hot soak-related emissions.

Exhaust emission factors for off-road equipment were obtained from the OFFROAD2017 database for equipment operating in Orange County in 2017. Each equipment was mapped to an OFFROAD2017 vehicle type, and emission factors are looked up based on vehicle category, engine model year, horsepower bin and fuel type. Where an exact model year and/or horsepower bin match was not identified, the closest horsepower bin was selected for the emission factor. Diesel emission factors were conservatively assumed for propane-fueled equipment since the OFFROAD2017 database does not have emission factors for propane-fueled equipment.

Table 4-9 and **Table 4-10** list the daily average ROG and NOx emissions from JWA's on-road and off-road fleet, respectively. Average daily emissions were calculated assuming operation for 365 days in a year.

4.4.2 BAU Emission Forecast

The BAU emissions inventory for JWA's fleet of on-road and off-road equipment followed the same methodology as that used to calculate baseline emissions. The fleet-averaged emission factors from the EMFAC2017 and OFFROAD2017 databases are used instead of model-year specific emission factors. Annual hours of usage in 2023 and 2031 are assumed to be the same as baseline hours of usage given that JWA does not have planned expansion of the Airport or airfield infrastructure at this time.

Table 4-9 and **Table 4-10** list the daily average ROG and NOx emissions from JWA's on-road and off-road fleet, respectively, for the two 2023 and 2031 BAU scenarios. Average daily emissions were calculated assuming operation for 365 days in a year.

4.4.3 Projected Emissions Benefit

The emissions reduction from the improved JWA owned fleet is calculated based on the usage of cleaner equipment. The calculation assumes that the measure will result in an accelerated turnover and therefore a cleaner fleet than that assumed in the BAU emissions inventory. The turnover time period and availability of alternative fueled vehicles will influence the upgrades. **Table 4-11** lists the improved on-road fleet in 2023 and 2031, along with emissions calculated for each vehicle. While the off-road equipment shown in **Table 4-10** are part of JWA's fleet of equipment, no improvements are expected to occur in the future beyond BAU and therefore they are not part of this measure. **Table 4-12** shows a summary of emission reductions in the improved future years relative to BAU. From this measure for the JWA on-road fleet, NOx emissions are expected to be reduced by [0.01] lb/day in 2023 and [0.04] lb/day in 2031 compared to the BAU emissions inventory. ROG emissions are expected to be reduced by [0.01] lb/day in 2023 and [0.08] lb/day in 2031 compared to the BAU emissions inventory. There are no emission reductions anticipated from JWA's off-road fleet compared to BAU. (NOTE, NUMBERS IN BRACKETS ARE PRELIMINARY, SUBJECT TO REFINEMENT PER FURTHER TECHNICAL WORK AND CONSULTATION WITH STAKEHOLDERS.)

4.5 Parking Shuttle Buses (Measure 5)

4.5.1 Baseline Emissions

The baseline parking shuttle bus emissions for 2017 are calculated based on the shuttle bus counts currently in operation as shown in **Table 4-13.** JWA does not currently own shuttles that transport passengers to its premises. However, the Airport contracts with a vendor to provide shuttle service from the Main Street off-site parking and employee parking lots to the Airport terminal. The calculations are based on shuttle bus model year, average travel speed, fuel type, and VMT in 2017.

On-road emission factors for exhaust, idling and starting ROG and NOx, 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. Vehicle model year is 2017 for the baseline scenario and aggregated for the future scenarios. Exhaust emission factors were calculated to be the average of the emission factors at the 25 mph speed bins 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. **Table 4-13** summarizes the daily average ROG and NOx emissions from the parking shuttle buses.

4.5.2 BAU Emission Forecast

The BAU emissions inventory for parking shuttle buses followed the same methodology as that used for the baseline emissions. The number of parking shuttle trips in 2023 and 2031 is calculated by scaling baseline parking shuttle trips by the growth in MAP at JWA between 2017 and 2023/2031. The emission factors from EMFAC2017 for 2023 and 2031 are used for this BAU emissions inventory. **Table 4-13** shows the assumptions and the daily average emissions of ROG and NOx from parking shuttle buses.

4.5.3 Projected Emissions Benefit

The emissions reduction from the electrification of parking shuttle buses is calculated based on the upgrading of the parking shuttle buses. The calculation assumes that electric buses have zero emissions. **Table 4-13** shows the emission reductions expected from this measure. NOx emissions are expected to be reduced by 0.90 lb/day in 2023 and 1.58 lb/day in 2031. ROG emissions are expected to be reduced by 0.17 lb/day in 2023 and 0.30 lb/day in 2031 compared to the BAU emissions inventory.

4.6 Construction Equipment (Measure 6)

4.6.1 Baseline Emissions

Construction activity levels vary each year, and there is no anticipated consistency or predictability for JWA construction activities that would support SIP creditable reductions. Therefore, a baseline construction emissions inventory was not prepared as part of this analysis. The ROG and NOx exhaust emission factors for the default fleet mix of construction and mining equipment in Orange County in 2017 are extracted from CARB's OFFROAD2017 database and shown in **Table 4-14**.

4.6.2 BAU Emission Forecast

There is no BAU emissions inventory for construction equipment. The construction fleet mix is represented based on exhaust emission rates for general fleet mix available in the region for CY 2023 and CY 2031 (see **Table 4-14**). Similar to the baseline, these factors are obtained using the OFFROAD 2017 "construction and mining" fleet mix.

4.6.3 Projected Emission Benefit

There is no emissions inventory for construction equipment as discussed in Section 4.6.1. Based on the measure, future construction fleet mixes will be Tier 4 equipment and the emission factors are shown in **Table 4-14**, which are based on OFFROAD and as provided in CalEEMod User's Guide, Appendix D, Table 3.5. The potential emissions benefit is represented in terms of percent reduction in emission factors when comparing to the BAU scenario.

4.7 Vehicles in the Parking Lot (Measure 7)

4.7.1 Baseline Emissions

Baseline emissions associated with vehicles idling in the parking lot for 2017 are calculated using average trips per day for a parking area. Average daily entry/exit counts from August 2018 for each of JWA's six parking lots is used to represent baseline (2017) average daily vehicle trips. Emissions are calculated using idling exhaust emission factors from EIR 617 (obtained from EMFAC 2011 for CY 2016) along with idling time of three minutes per vehicle in JWA's parking lots. The vehicle emission factors used are tabulated in **Table 4-15**, and the assumptions and the daily average ROG and NOx emissions are shown in **Table 4-16**.

4.7.2 BAU Emission Forecast

The BAU emissions inventory for vehicles traveling in the parking lot followed the same methodology as that used for the baseline emissions. BAU parking lot activity in 2023 and 2031 is calculated by scaling baseline parking lot activity by the growth in MAP at JWA between 2017 and 2023/2031. BAU emissions are calculated using idling exhaust emission factors from EIR 617 (obtained from EMFAC 2011 for CY 2021 and CY2026, respectively) along with idling time of three minutes per vehicle in JWA's parking lots. **Table 4-15** shows the emission factors used, and **Table 4-16** shows the assumptions and the daily average emissions of ROG and NOx from vehicles in the parking lot.

4.7.3 Projected Emission Benefit

The emission reduction due to Smart parking features is calculated based on an estimate of reduced idling time. For purposes of this analysis, it is assumed that the idling time is reduced by 50% to 1.5 minutes for the future year scenario (see **Table 4-16**). From this measure, NOx emissions are expected to be reduced by 0.49 lb/day in 2023 and 0.43 lb/day in 2031 compared to the BAU emissions inventory. ROG emissions are expected to be reduced by 0.30 lb/day in 2023 and 0.26 lb/day in 2031 compared to the BAU emissions inventory.

4.8 Airport Loop Vehicle Traffic (Measure 8)

4.8.1 Baseline Emissions

Baseline emissions for airport loop traffic for 2017 are based on data collected by JWA for the number of vehicles entering the cell phone waiting lot. Average daily entry/exit counts from August 2018 for JWA's cell phone lot is used to represent the baseline (2017). The vehicle miles avoided by waiting at these lots are calculated based on the distance around the airport loop (1.23 miles as measured by Google Earth) and an assumption that on average a person would otherwise circle the airport loop two times, resulting in 1,589 miles/day for baseline (2017). Emissions are calculated using running exhaust emission factors from EMFAC2017 (for CY 2017) along with the vehicle miles avoided. The vehicle emission factors used are tabulated in **Table 4-17**. The assumptions and the daily average ROG and NOx emissions are shown in **Table 4-18**.

4.8.2 BAU Emission Forecast

The BAU emissions inventory for vehicles traveling on the airport loop followed the same methodology as that used for the baseline emissions. Cell phone lot vehicular traffic in 2023 and 2031 is calculated by scaling baseline traffic entering the cell phone lot by the growth in MAP at JWA between 2017 and 2023/2031. Emissions are calculated using running exhaust emission factors from EMFAC2017 (for CY 2023 and CY 2031, respectively) combined with the vehicle miles avoided (1,737 miles/day for CY 2023 and 1,839 miles/day for CY 2031). **Tables 4-17** shows the emission factors used, and **Table 4-18** shows the assumptions and the daily average emissions of ROG and NOx from vehicles on the airport loop.

4.8.3 Projected Emission Benefit

The emission reduction due to airport loop vehicle reduction is equal to vehicle miles avoided emissions, as explained in Section 4.8.2 (see **Table 4-18**). From this measure, NOx emissions are expected to be reduced by 0.17 lb/day in 2023 and 0.09 lb/day in 2031 compared to the BAU emissions inventory. ROG emissions are expected to be reduced by 0.04 lb/day in 2023 and 0.02 lb/day in 2031 compared to the BAU emissions inventory.

4.9 TNCs (Measure 9)

4.9.1 Baseline Emissions

Baseline emissions for TNCs in 2017 are based on data collected by JWA for the number of passenger pick-ups performed at the airport. Average daily passenger pick-up counts from November 2018 is used to represent the baseline (2017). The vehicle miles are calculated based on the distance around the airport loop (1.23 miles as measured by Google Earth) and an assumption that on average TNC vehicles would circle the airport loop two times while waiting for a pick-up to be scheduled. The baseline represents vehicle miles that would be avoided by the implementation of this measure. This results in 3,070 miles/day for baseline (2017). Emissions are calculated using running exhaust emission factors from EMFAC2017 (for CY 2017) along with the vehicle miles traveled. The vehicle emission factors used are tabulated in **Table 4-17**. The assumptions and the daily average ROG and NOx emissions are shown in **Table 4-19**.

4.9.2 BAU Emission Forecast

The BAU emissions inventory for TNC vehicles followed the same methodology as that used for the baseline emissions. TNC vehicular traffic in 2023 and 2031 is calculated by scaling baseline traffic by the growth in MAP at JWA between 2017 and 2023/2031. Emissions are calculated using running exhaust emission factors from EMFAC2017 (for CY 2023 and CY 2031, respectively) combined with the vehicle miles avoided due to implementation of this measure (3,354 miles/day for CY 2023 and 3,553 miles/day for CY 2031). **Table 4-17** shows the emission factors used, and **Table 4-19** shows the assumptions and the daily average emissions of ROG and NOx from TNC vehicles at the airport.

4.9.3 Projected Emission Benefit

The emission reduction due to TNC vehicle miles reduction policy is based on the vehicle miles avoided by not traveling around the airport loop while waiting for pick-ups, as explained in Section 4.9.2. Emission reductions are tabulated in **Table 4-19**. From this measure, NOx emissions are expected to be reduced by 0.33 lb/day in 2023 and 0.17 lb/day in 2031 compared to the BAU emissions inventory. ROG emissions are expected to be reduced by 0.08 lb/day in 2023 and 0.03 lb/day in 2031 compared to the BAU emissions inventory.

4.10 Taxi Fleet (Initiative 1)

Since the initiative is to help enforce an existing regulation, the inventory is not compiled.

4.11 EV Chargers (Initiative 2)

It is unclear how the SCAQMD can claim SIP creditable reductions for EV charger installation. Therefore, an emissions inventory was not prepared as part of this analysis. The ROG and NOx exhaust emission factors for the default fleet mix of light-duty vehicles in Orange County in 2017 are extracted from CARB's EMFAC2017 database and shown in **Table 4-17**.

4.12 Passenger Transportation (Initiative 3)

This initiative does not have a well-defined achievement to support SIP creditable emission reductions. Therefore, an emissions inventory was not prepared as part of this analysis.

4.13 Employee Commuting (Initiative 4)

4.13.1 Baseline Emissions

a. Bike-Share Program

Baseline emissions associated with employees commuting for 2017 are calculated using information from 2018 JWA employee rideshare survey results. Daily employee vehicle miles are calculated assuming two trips per vehicle (commute to and from home), one vehicle per employee driving alone to work and employee mileage of 13.08 miles per trip per day, which is the average trip length from EIR 617. Emissions are calculated using vehicle emission factors from EMFAC2017 (for CY 2017) combined with employee commute miles. The vehicle emission factors used are tabulated in **Table 4-20**. The assumptions and the daily average ROG and NOx emissions are shown in **Table 4-21**.

b. County Ride-Share Program

Baseline emissions associated with employees commuting are discussed above. In addition to employees who drive alone to work, approximately 4.5 percent of the employees participated in carpool in CY 2018 based on the survey data. The calculations conservatively assume 5-person occupancy per carpool vehicle. Daily vehicle miles are calculated assuming two trips per vehicle (commute to and from home). The vehicle emission factors used are tabulated in **Table 4-20**. The assumptions and the daily average ROG and NOx emissions are shown in **Table 4-22**.

4.13.2 BAU Emission Forecast

a. Bike-Share Program

The BAU emissions inventory for employee commuting followed the same methodology as that used for the baseline emissions. BAU emissions for future year scenarios (CY 2023 and CY 2031) are calculated by assuming 5% growth for employee commute miles (from driving alone) combined with vehicle emission factors from EMFAC 2017. The vehicle emission factors used are tabulated in **Table 4-20**. The assumptions and the daily average ROG and NOx emissions from vehicles on the airport loop are shown in **Table 4-21**.

b. County Ride-Share Program

The BAU emissions inventory for employee commuting via ride share follows that for the bike-share program. The vehicle emission factors used are tabulated in **Table 4-20**. The assumptions and the daily average ROG and NOx emissions are shown in **Table 4-22**.

4.13.3 Projected Emission Benefit

a. Bike-Share Program

The emissions reduction due to the bike-share program is calculated based on an improvement in participation. The calculation assumes a 1 percent reduction in employee vehicle commute in the future years (CY 2023 and CY 2031) due to increased participation in the bike-share program. From this measure, NOx emissions are expected to be reduced by 0.006 lb/day in 2023 and 0.003 lb/day in 2031 compared to the BAU emissions inventory. ROG emissions are expected to be reduced by 0.007 lb/day in 2023 and 0.005 lb/day in 2031 compared to the BAU emissions inventory (see **Table 4-21**).

b. County Ride-Share Program

The emissions reduction due to the County Ride-Share Program is calculated based on an improvement in participation. The calculation assumes a 1 percent improvement in participation of carpooling. From this measure, NOx emissions are expected to be reduced by 0.017 lb/day in 2023 and 0.011 lb/day in 2031. ROG emissions are expected to be reduced by 0.023 lb/day in 2023 and 0.017 lb/day in 2031 compared to the BAU emissions inventory (see **Table 4-22**).

A summary of emissions results (baseline, BAU forecast, and emissions reduction) is provided in **Table 4-23.**

5. IMPLEMENTATION AND PROGRESS ASSESSMENT

5.1 Implementation Approach

JWA will lead the implementation of the initiatives and measures through their Facilities Planning and Development Department. The Airport Environmental Manager within that department will be responsible for coordinating the Airport's efforts for the initiatives and measures as described in Section 3 of this AQIP. The approach will be developed on a case-by-case basis given the variety of Airport operations, tenants, and third parties that may be involved for each initiative and measure.

5.2 Progress Assessment

JWA will assess the progress of each initiative and measure on an annual basis. Information relative to each initiative and measure will be collected routinely to provide an annual assessment of progress towards the initiative or measure target as discussed in Section 3.

TABLES

Table 4-1. Passenger and Commercial Air Traffic Growth at JWA
John Wayne Airport AQIP
Santa Ana, California

Calendar Year	**2017**	**2023**	**2031**
EIR 617 Phase[1]	Phase 1 (2016-2020)	Phase 2 (2021-2025)	Phase 3 (2026-2030)
MAP	10.8	11.8	12.5
	Percent Increase	**9%**	**16%**
ADD	85.00	95.00	95.00
	Percent Increase	**12%**	**12%**

Notes:

[1] The number of million annual passengers (MAP) and average daily departures (ADD) is taken from EIR 617.

Abbreviations:

ADD - Average Daily Departures

MAP - Million Annual Passengers

Table 4-2. JWA GSE List and Emissions for 2017 Baseline
John Wayne Airport AQIP
Santa Ana, California

Row Number	GSE Type[1]	Fuel Type[1]	Engine Model Year[1]	Engine Rated HP[1]	Annual Hours 2017[2]	Load Factor[3]	ROG EF (g/bhp-hr)[3]	NOx EF (g/bhp-hr)[3]	ROG (lb/day)	NOx (lb/day)
1	Belt Loader	Electric	1999	84	499	0.34	--	--	--	--
2	Aircraft Tractor	Diesel	1998	88	320	0.54	1.10	7.4	0.101	0.680
3	Belt Loader	Electric	1969	84	499	0.34	--	--	--	--
4	Aircraft Tractor	Diesel	1980	101	320	0.54	1.24	12.9	0.130	1.347
5	Belt Loader	Electric	2002	59	499	0.34	--	--	--	--
6	Cargo Loader	Diesel	2016	110	459	0.34	0.05	0.26	0.005	0.026
7	Aircraft Tractor	Diesel	2012	65	320	0.54	0.11	2.5	0.008	0.165
8	Aircraft Tractor	Diesel	1990	110	320	0.54	0.82	9.1	0.094	1.035
9	Belt Loader	Electric	2001	84	499	0.34	--	--	--	--
10	Aircraft Tractor	Diesel	2001	88	320	0.54	0.99	7.3	0.090	0.667
11	Belt Loader	Electric	2002	84	499	0.34	--	--	--	--
12	Belt Loader	Electric	2002	59	499	0.34	--	--	--	--
13	Belt Loader	Electric	2000	84	499	0.34	--	--	--	--
14	Baggage Tractor	Electric	1969	93	714	0.37	--	--	--	--
15	Cargo Loader	Diesel	1997	152	459	0.34	0.84	7.9	0.119	1.119
16	Belt Loader	Electric	1999	84	499	0.34	--	--	--	--
17	Aircraft Tractor	Electric	2001	110	320	0.54	--	--	--	--
18	Aircraft Tractor	Diesel	2011	175	320	0.54	0.14	2.4	0.025	0.434
19	Belt Loader	Electric	2001	84	499	0.34	--	--	--	--
20	Baggage Tractor	Electric	2001	93	714	0.37	--	--	--	--
21	Aircraft Tractor	Electric	2001	110	320	0.54	--	--	--	--
22	Aircraft Tractor	Diesel	2001	87	320	0.54	0.99	7.3	0.089	0.659
23	Aircraft Tractor	Diesel	2014	74	320	0.54	0.10	2.4	0.008	0.187
24	Belt Loader	Diesel	1991	55	499	0.34	1.34	10.4	0.075	0.578
25	Aircraft Tractor	Diesel	2000	100	320	0.54	0.74	7.4	0.077	0.763
26	Aircraft Tractor	Diesel	2009	110	320	0.54	0.15	2.4	0.017	0.277
27	Aircraft Tractor	Diesel	2014	74	320	0.54	0.10	2.4	0.008	0.187
28	Aircraft Tractor	Electric	1988	140	320	0.54	--	--	--	--
29	Baggage Tractor	Electric	1969	93	714	0.37	--	--	--	--
30	Belt Loader	Electric	1969	84	499	0.34	--	--	--	--
31	Cargo Loader	Diesel	2007	99	459	0.34	0.28	5.1	0.026	0.468
32	Aircraft Tractor	Diesel	2000	210	320	0.54	0.35	6.6	0.075	1.444
33	Aircraft Tractor	Electric	2001	110	320	0.54	--	--	--	--
34	Belt Loader	Electric	2002	84	499	0.34	--	--	--	--
35	Baggage Tractor	Electric	1969	93	714	0.37	--	--	--	--
36	Aircraft Tractor	Diesel	1993	210	320	0.54	0.81	9.0	0.177	1.964
37	Belt Loader	Electric	1969	84	499	0.34	--	--	--	--
38	Lift	Diesel	2012	67	404	0.34	0.12	2.47	0.007	0.135
39	Baggage Tractor	Diesel	2015	85	714	0.37	0.19	2.9	0.026	0.393
40	Cargo Loader	Diesel	2009	110	459	0.34	0.17	2.68	0.018	0.274
41	Aircraft Tractor	Diesel	2000	87	320	0.54	1.08	7.4	0.097	0.664
42	Baggage Tractor	Electric	2000	93	714	0.37	--	--	--	--
43	Aircraft Tractor	Diesel	2018	74	320	0.54	0.07	1.33	0.005	0.102
44	Baggage Tractor	Electric	1969	93	714	0.37	--	--	--	--
45	Lift	Diesel	2016	67	404	0.34	0.07	1.34	0.004	0.073
46	Baggage Tractor	Electric	2001	93	714	0.37	--	--	--	--
47	Baggage Tractor	Electric	2000	93	714	0.37	--	--	--	--
48	Belt Loader	Electric	2004	84.4	499	0.34	--	--	--	--
49	Belt Loader	Electric	2005	19	499	0.34	--	--	--	--
50	Cargo Tractor	Gasoline	2017	86	1235	0.36	0.45	3.2	0.104	0.744
51	Baggage Tractor	Gasoline	1992	107	870	0.37	1.50	6.2	0.310	1.289
52	Belt Loader	Electric	2001	19	499	0.34	--	--	--	--
53	Cargo Tractor	Gasoline	2010	80	1235	0.36	1.07	5.4	0.231	1.172
54	Belt Loader	Electric	2005	19	499	0.34	--	--	--	--
55	Baggage Tractor	Electric	2007	40	714	0.37	--	--	--	--
56	Belt Loader	Electric	2015	19	499	0.34	--	--	--	--
57	Aircraft Tractor	Electric	2016	200.4	320	0.54	--	--	--	--
58	Fork Lift	Electric	2008	53	368	0.20	--	--	--	--
59	Belt Loader	Electric	2007	19	499	0.34	--	--	--	--
60	Passenger Stand	Gasoline	2017	61	177	0.40	0.23	3.2	0.006	0.082
61	Belt Loader	Electric	2015	19	499	0.34	--	--	--	--
62	Baggage Tractor	Electric	1999	92.5	714	0.37	--	--	--	--
63	Cargo Tractor	Gasoline	2015	100.8	1235	0.36	0.63	3.8	0.170	1.045

Table 4-2. JWA GSE List and Emissions for 2017 Baseline
John Wayne Airport AQIP
Santa Ana, California

Row Number	GSE Type[1]	Fuel Type[1]	Engine Model Year[1]	Engine Rated HP[1]	Annual Hours 2017[2]	Load Factor[3]	ROG EF (g/bhp-hr)[3]	NOx EF (g/bhp-hr)[3]	ROG (lb/day)	NOx (lb/day)
64	Baggage Tractor	Electric	2015	40	714	0.37	--	--	--	--
65	Baggage Tractor	Electric	2005	40	714	0.37	--	--	--	--
66	Baggage Tractor	Electric	2004	40	714	0.37	--	--	--	--
67	Belt Loader	Electric	2004	19	499	0.34	--	--	--	--
68	Baggage Tractor	Gasoline	2008	100	870	0.37	0.93	4.9	0.180	0.957
69	Cart	Electric	2007	6.6	1272	0.34	--	--	--	--
70	Belt Loader	Electric	2004	19	499	0.34	--	--	--	--
71	Belt Loader	Electric	2001	19	499	0.34	--	--	--	--
72	Baggage Tractor	Electric	2015	40	714	0.37	--	--	--	--
73	Baggage Tractor	Electric	2008	92.5	714	0.37	--	--	--	--
74	Baggage Tractor	Electric	2004	40	714	0.37	--	--	--	--
75	Baggage Tractor	Electric	2005	40	714	0.37	--	--	--	--
76	Baggage Tractor	Electric	2018	49	714	0.37	--	--	--	--
77	Baggage Tractor	Electric	2005	40	714	0.37	--	--	--	--
78	Passenger Stand	Electric	2004	19	47	0.40	--	--	--	--
79	Baggage Tractor	Electric	2018	40	714	0.37	--	--	--	--
80	Baggage Tractor	Electric	2018	40	714	0.37	--	--	--	--
81	Baggage Tractor	Electric	2018	49	714	0.37	--	--	--	--
82	Baggage Tractor	Electric	2005	40	714	0.37	--	--	--	--
83	Belt Loader	Electric	2015	19	499	0.34	--	--	--	--
84	Other	Gasoline	1998	260	182	0.34	6.6	12.0	0.631	1.149
85	Baggage Tractor	Electric	2018	40	714	0.37	--	--	--	--
86	Baggage Tractor	Electric	2018	49	714	0.37	--	--	--	--
87	Baggage Tractor	Electric	2005	40	714	0.37	--	--	--	--
88	Other	Gasoline	1990	137.8	182	0.34	5.0	8.5	0.252	0.434
89	Baggage Tractor	Electric	2005	40	714	0.37	--	--	--	--
90	Cart	Electric	2006	55	1272	0.34	--	--	--	--
91	Cargo Tractor	Gasoline	2002	124	1235	0.36	8.8	21.1	2.957	7.075
92	Baggage Tractor	Electric	2008	92.5	714	0.37	--	--	--	--
93	Catering Truck	Gasoline	2016	200	0,883	0.34	0.12	1.31	0.043	0.469
94	Belt Loader	Electric	2007	19	499	0.34	--	--	--	--
95	Cargo Loader	Gasoline	2015	101.7	764	0.34	0.50	3.4	0.078	0.531
96	Service Truck	Gasoline	2017	132.5	0,883	0.34	0.10	1.28	0.025	0.304
97	Baggage Tractor	Electric	2002	40	714	0.37	--	--	--	--
98	Cargo Tractor	Gasoline	1994	100.8	1235	0.36	12.3	18.4	3.344	5.000
99	Baggage Tractor	Electric	2015	40	714	0.37	--	--	--	--
100	Baggage Tractor	Electric	2018	49	714	0.37	--	--	--	--
101	Baggage Tractor	Electric	2004	40	714	0.37	--	--	--	--
102	Lift	Electric	2009	113.6	404	0.34	--	--	--	--
103	Cargo Tractor	Gasoline	2018	86	1235	0.36	0.45	3.2	0.104	0.744
104	Lavatory Truck	Gasoline	1993	250	1,163	0.34	2.35	17.2	1.381	10.114
105	Lift	Electric	2005	59	404	0.34	--	--	--	--
106	Baggage Tractor	Electric	2018	40	714	0.37	--	--	--	--
107	Baggage Tractor	Electric	2000	92.5	714	0.37	--	--	--	--
108	Cargo Tractor	Gasoline	2015	100.8	1235	0.36	0.63	3.8	0.170	1.045
109	Belt Loader	Electric	2004	84.4	499	0.34	--	--	--	--
110	Belt Loader	Electric	2015	19	499	0.34	--	--	--	--
111	Cargo Tractor	Gasoline	2015	100.8	1235	0.36	0.63	3.8	0.170	1.045
112	Lavatory Truck	Gasoline	2000	65	1,163	0.34	2.35	17.2	0.359	2.630
113	Baggage Tractor	Gasoline	2004	202	870	0.37	1.50	6.2	0.585	2.434
114	Lavatory Truck	Gasoline	2011	260	1,163	0.34	0.31	1.96	0.192	1.201
115	Catering Truck	Gasoline	2017	362	0,883	0.34	0.10	1.28	0.067	0.831
116	Aircraft Tractor	Electric	2016	200.4	320	0.54	--	--	--	--
117	Baggage Tractor	Electric	2005	40	714	0.37	--	--	--	--
118	Cargo Tractor	Gasoline	2017	86	1235	0.36	0.45	3.2	0.104	0.744
119	Baggage Tractor	Electric	2005	40	714	0.37	--	--	--	--
120	Baggage Tractor	Electric	2018	40	714	0.37	--	--	--	--
121	Cargo Tractor	Gasoline	2010	80	1235	0.36	1.07	5.4	0.231	1.172
122	Baggage Tractor	Electric	2004	40	714	0.37	--	--	--	--
123	Baggage Tractor	Electric	2018	40	714	0.37	--	--	--	--
124	Baggage Tractor	Electric	2008	92.5	714	0.37	--	--	--	--
125	Baggage Tractor	Electric	2018	40	714	0.37	--	--	--	--
126	Cargo Tractor	Gasoline	2010	80	1235	0.36	1.07	5.4	0.231	1.172

Table 4-2. JWA GSE List and Emissions for 2017 Baseline
John Wayne Airport AQIP
Santa Ana, California

Row Number	GSE Type[1]	Fuel Type[1]	Engine Model Year[1]	Engine Rated HP[1]	Annual Hours 2017[2]	Load Factor[3]	ROG EF (g/bhp-hr)[3]	NOx EF (g/bhp-hr)[3]	ROG (lb/day)	NOx (lb/day)
127	Baggage Tractor	Electric	2015	40	714	0.37	--	--	--	--
128	Service Truck	Electric	2018	7	0,464	0.34	--	--	--	--
129	Baggage Tractor	Electric	2005	40	714	0.37	--	--	--	--
130	Belt Loader	Gasoline	1994	84.4	786	0.34	1.58	6.5	0.212	0.870
131	Belt Loader	Electric	2001	19	499	0.34	--	--	--	--
132	Baggage Tractor	Electric	2005	40	714	0.37	--	--	--	--
133	Baggage Tractor	Electric	2004	92.5	714	0.37	--	--	--	--
134	Baggage Tractor	Electric	2001	92.5	714	0.37	--	--	--	--
135	Belt Loader	Electric	2001	19	499	0.34	--	--	--	--
136	BAG TUG	Electric	2005	40	714	0.37	--	--	--	--
137	BAG TUG	Electric	2005	40	714	0.37	--	--	--	--
138	BELT LOADER	Electric	2006	19	499	0.34	--	--	--	--
139	BELT LOADER	Electric	2006	19	499	0.34	--	--	--	--
140	PUSH BACK	Diesel	2008	100	320	0.54	0.15	2.5	0.016	0.262
141	AC TOW TRACTOR	Diesel	1980	101	320	0.54	1.24	12.9	0.130	1.347
142	PAX STAIRS	Diesel	2017	61	47	0.40	0.04	0.25	0.000	0.002
143	LAV TRUCK	Gasoline	1993	250	1,163	0.34	2.35	17.2	1.381	10.114
144	BAG TRACTOR	Diesel	2015	85	714	0.37	0.19	2.9	0.026	0.393
145	BAG TRACTOR	Diesel	2015	85	714	0.37	0.19	2.9	0.026	0.393
146	BAG TRACTOR	Diesel	2015	85	714	0.37	0.19	2.9	0.026	0.393
147	BAG TRACTOR	Diesel	2015	85	714	0.37	0.19	2.9	0.026	0.393
148	BELT LOADER	Diesel	1991	55	499	0.34	1.34	10.4	0.075	0.578
149	BELT LOADER	Diesel	1991	55	499	0.34	1.34	10.4	0.075	0.578
150	BELT LOADER	Diesel	1991	55	499	0.34	1.34	10.4	0.075	0.578
151	AC TOW TRACTOR	Diesel	1980	101	320	0.54	1.24	12.9	0.130	1.347
152	AC TOW TRACTOR	Gasoline	1980	101	729	0.54	1.51	11.6	0.361	2.766
153	LAV CART	Gasoline	1993	250	0,122	0.34	5.0	4.2	0.311	0.261
154	AC TOW TRACTOR	Diesel	1980	101	320	0.54	1.24	12.9	0.130	1.347
155	BAG TRACTOR	Diesel	2015	85	714	0.37	0.19	2.9	0.026	0.393
156	MANUAL PAX STAIRS	Gasoline	2017	61	177	0.40	0.23	3.2	0.006	0.082
157	BELT LOADER	Gasoline	1994	84.4	786	0.34	1.58	6.5	0.212	0.870
158	BELT LOADER	Gasoline	1994	84.4	786	0.34	1.58	6.5	0.212	0.870
159	AC TOW TRACTOR	Electric	2001	110	320	0.54	--	--	--	--
160	BELT LOADER	Electric	2005	19	499	0.34	--	--	--	--
161	BAG TRACTOR	Electric	2005	40	714	0.37	--	--	--	--
162	BAG TRACTOR	Electric	2005	40	714	0.37	--	--	--	--
163	BAG TRACTOR	Electric	2005	40	714	0.37	--	--	--	--
164	Ground Power Unit	Diesel	2015	155	464	0.34	0.06	0.26	0.008	0.038
165	Air Start	Diesel	2017	600	1272	0.34	0.12	0.64	0.190	0.989
166	Ground Power Unit	Diesel	1997	181	464	0.34	0.40	7.2	0.068	1.227
167	Ground Power Unit	Diesel	2007	220	464	0.34	0.19	2.47	0.040	0.511
168	Ground Power Unit	Diesel	1997	500	464	0.34	0.40	7.2	0.188	3.389
169	Ground Power Unit	Diesel	2007	220	464	0.34	0.19	2.47	0.040	0.511
170	Ground Power Unit	Diesel	2006	173	464	0.34	0.22	4.5	0.035	0.728
171	Ground Power Unit	Diesel	2015	155	464	0.34	0.06	0.26	0.008	0.038
172	Ground Power Unit	Diesel	2001	194	464	0.34	0.38	7.0	0.070	1.281
173	Air Start	Diesel	2015	333	1272	0.34	0.06	0.68	0.052	0.579
174	Ground Power Unit	Diesel	2000	152	464	0.34	0.81	7.8	0.116	1.108
175	Ground Power Unit	Diesel	1998	152	464	0.34	0.84	7.9	0.119	1.128
176	Ground Power Unit	Diesel	2005	219	464	0.34	0.22	4.4	0.046	0.900
177	Air Start	Diesel	2007	665	1272	0.34	0.29	2.41	0.504	4.120
178	Air Start	Diesel	1999	330	1272	0.34	0.33	5.5	0.284	4.692
179	Ground Power Unit	Diesel	1998	152	464	0.34	0.84	7.9	0.119	1.128
180	Ground Power Unit	Diesel	1999	185	464	0.34	1.19	13.1	0.207	2.271

Table 4-2. JWA GSE List and Emissions for 2017 Baseline
John Wayne Airport AQIP
Santa Ana, California

Row Number	GSE Type[1]	Fuel Type[1]	Engine Model Year[1]	Engine Rated HP[1]	Annual Hours 2017[2]	Load Factor[3]	ROG EF (g/bhp-hr)[3]	NOx EF (g/bhp-hr)[3]	ROG (lb/day)	NOx (lb/day)
181	Air Start	Diesel	2007	630	1272	0.34	0.29	2.41	0.478	3.903
182	GROUND POWER	Diesel	1997	181	464	0.34	0.40	7.2	0.068	1.227
183	AIR START	Diesel	1999	665	1272	0.34	0.33	6.0	0.573	10.204
184	GROUND POWER	Diesel	1997	181	464	0.34	0.40	7.2	0.068	1.227
								Total Emissions (lb/day)	**20**	**122**

Notes:

[1] List of GSEs including fuel type, engine model year and engine horsepower are provided by A4A, Delta Airlines and Frontier Airlines for JWA. Nonmotorized equipment and on-road vehicles (e.g., pickup truck, van) were excluded from the provided inventory. Where engine model year or horsepower were not provided, data was back-filled based on typical parameters of similar equipment operating at JWA.
[2] GSE annual usage hours were calculated using activity from the OFFROAD2017 database for CY 2017.

[3] Model year-specific emission factors from OFFROAD2017 were derived by dividing total emissions by the total annual horsepower-hours and load factor for each equipment type and horsepower bin. Electric vehicles are assigned an EF of 0. Emissions are calculated by multiplying the respective EFs by the equipment horsepower, load factor and hours of usage in 2017 and converted to an average daily emission rate assuming 365 days of operation.

Abbreviations:

bhp - brake horsepower	lb - pound
EF - emission factor	NO_X - oxides of Nitrogen
g - grams	ROG - reactive organic gases

Table 4-3. GSE Mapping to OFFROAD2017 Equipment Types
John Wayne Airport AQIP
Santa Ana, California

GSE Category	OFFROAD Category (Diesel)	OFFROAD Category (Gasoline & Natural Gas)
Air Conditioner	Portable Equipment - Non-Rental Generator	OFF - AirGrSupp - Air Conditioner
Air Start	Portable Equipment - Non-Rental Generator	OFF - AirGrSupp - Air Start Unit
Aircraft Tug	AirGrSupp - A/C Tug Narrow Body	OFF - AirGrSupp - A/C Tug Narrow Body
Backhoe	ConstMin - Tractors/Loaders/Backhoes	ConstMin - Tractors/Loaders/Backhoes
Bag Tug	AirGrSupp - Baggage Tug	OFF - AirGrSupp - Baggage Tug
Belt Loader	AirGrSupp - Belt Loader	OFF - AirGrSupp - Belt Loader
Cargo Loader	AirGrSupp - Cargo Loader	OFF - AirGrSupp - Cargo Loader
Cargo Tractor	AirGrSupp - Cargo Tractor	OFF - AirGrSupp - Cargo Tractor
Fork Lift	AirGrSupp - Forklift	OFF - AirGrSupp - Forklift
Fuel Truck	AirGrSupp - Other GSE	OFF - AirGrSupp - Fuel Truck
Generator	Portable Equipment - Non-Rental Generator	OFF - AirGrSupp - Generator
Golf Cart	Portable Equipment - Non-Rental Generator	OFF - AirGrSupp - Cart
GPU	AirGrSupp - Other GSE	OFF - AirGrSupp - Ground Power Unit
Lavatory Cart	AirGrSupp - Other GSE	OFF - AirGrSupp - Lav Cart
Lavatory Truck	AirGrSupp - Other GSE	OFF - AirGrSupp - Lav Truck
Lift	AirGrSupp - Lift	OFF - AirGrSupp - Lift
Other GSE	AirGrSupp - Other GSE	OFF - AirGrSupp - Other GSE
Passenger Stairs	AirGrSupp - Passenger Stand	OFF - AirGrSupp - Passenger Stand
Push Back	AirGrSupp - A/C Tug Narrow Body	OFF - AirGrSupp - A/C Tug Narrow Body
Service Truck	AirGrSupp - Other GSE	OFF - AirGrSupp - Service Truck
Skid Steer Loader	ConstMin - Skid Steer Loaders	ConstMin - Skid Steer Loaders
Sweeper	ConstMin - Sweepers/Scrubbers	OFF - AirGrSupp - Sweeper

Table 4-4. JWA GSE List and Emissions for 2023 BAU
John Wayne Airport AQIP
Santa Ana, California

Row Number	GSE Type[1]	Fuel Type[1]	Engine Model Year[2]	Engine Rated HP[1]	Annual Hours 2023[3]	Load Factor[4]	ROG EF (g/bhp-hr)[4]	NOx EF (g/bhp-hr)[4]	ROG (lb/day)	NOx (lb/day)
1	Belt Loader	Electric	2005	84	558	0.34	--	--	--	--
2	Aircraft Tractor	Diesel	2004	88	358	0.54	0.57	5.93	0.052	0.541
3	Belt Loader	Electric	1975	84	558	0.34	--	--	--	--
4	Aircraft Tractor	Diesel	1986	101	358	0.54	1.17	12.93	0.123	1.355
5	Belt Loader	Electric	2008	59	558	0.34	--	--	--	--
6	Cargo Loader	Diesel	2022	110	513	0.34	0.05	0.26	0.005	0.026
7	Aircraft Tractor	Diesel	2018	65	358	0.54	0.09	1.36	0.006	0.092
8	Aircraft Tractor	Diesel	1996	110	358	0.54	1.20	9.72	0.137	1.109
9	Belt Loader	Electric	2007	84	558	0.34	--	--	--	--
10	Aircraft Tractor	Diesel	2007	88	358	0.54	0.24	3.84	0.022	0.350
11	Belt Loader	Electric	2008	84	558	0.34	--	--	--	--
12	Belt Loader	Electric	2008	59	558	0.34	--	--	--	--
13	Belt Loader	Electric	2006	84	558	0.34	--	--	--	--
14	Baggage Tractor	Electric	1975	93	798	0.37	--	--	--	--
15	Cargo Loader	Diesel	2003	152	513	0.34	0.51	5.82	0.072	0.822
16	Belt Loader	Electric	2005	84	558	0.34	--	--	--	--
17	Aircraft Tractor	Electric	2007	110	358	0.54	--	--	--	--
18	Aircraft Tractor	Diesel	2017	175	358	0.54	0.06	0.26	0.012	0.048
19	Belt Loader	Electric	2007	84	558	0.34	--	--	--	--
20	Baggage Tractor	Electric	2007	93	798	0.37	--	--	--	--
21	Aircraft Tractor	Electric	2007	110	358	0.54	--	--	--	--
22	Aircraft Tractor	Diesel	2007	87	358	0.54	0.24	3.84	0.022	0.346
23	Aircraft Tractor	Diesel	2020	74	358	0.54	0.07	0.88	0.005	0.067
24	Belt Loader	Diesel	1997	55	558	0.34	1.34	10.40	0.075	0.578
25	Aircraft Tractor	Diesel	2006	100	358	0.54	0.29	5.03	0.030	0.522
26	Aircraft Tractor	Diesel	2015	110	358	0.54	0.07	0.27	0.008	0.030
27	Aircraft Tractor	Diesel	2020	74	358	0.54	0.07	0.88	0.005	0.067
28	Aircraft Tractor	Electric	1994	140	358	0.54	--	--	--	--
29	Baggage Tractor	Electric	1975	93	798	0.37	--	--	--	--
30	Belt Loader	Electric	1975	84	558	0.34	--	--	--	--
31	Cargo Loader	Diesel	2013	99	513	0.34	0.17	2.55	0.016	0.235
32	Aircraft Tractor	Diesel	2006	210	358	0.54	0.22	4.47	0.047	0.974
33	Aircraft Tractor	Electric	2007	110	358	0.54	--	--	--	--
34	Belt Loader	Electric	2008	84	558	0.34	--	--	--	--
35	Baggage Tractor	Electric	1975	93	798	0.37	--	--	--	--
36	Aircraft Tractor	Diesel	1999	210	358	0.54	0.38	6.95	0.082	1.514
37	Belt Loader	Electric	1975	84	558	0.34	--	--	--	--
38	Lift	Diesel	2018	67	451	0.34	0.10	1.37	0.005	0.075
39	Baggage Tractor	Diesel	2017	85	798	0.37	0.13	1.41	0.018	0.191
40	Cargo Loader	Diesel	2015	110	513	0.34	0.08	0.27	0.009	0.028
41	Aircraft Tractor	Diesel	2006	87	358	0.54	0.29	5.03	0.026	0.454
42	Baggage Tractor	Electric	2006	93	798	0.37	--	--	--	--
43	Aircraft Tractor	Diesel	2023	74	358	0.54	0.07	1.33	0.005	0.102
44	Baggage Tractor	Electric	1975	93	798	0.37	--	--	--	--
45	Lift	Diesel	2022	67	451	0.34	0.07	1.34	0.004	0.073
46	Baggage Tractor	Electric	2007	93	798	0.37	--	--	--	--
47	Baggage Tractor	Electric	2006	93	798	0.37	--	--	--	--
48	Belt Loader	Electric	2010	84	558	0.34	--	--	--	--
49	Belt Loader	Electric	2011	19	558	0.34	--	--	--	--
50	Cargo Tractor	Gasoline	2023	86	1380	0.36	0.45	3.21	0.104	0.744
51	Baggage Tractor	Gasoline	2012	107	972	0.37	1.06	5.44	0.220	1.127
52	Belt Loader	Electric	2007	19	558	0.34	--	--	--	--
53	Cargo Tractor	Gasoline	2016	80	1380	0.36	1.07	5.43	0.231	1.172
54	Belt Loader	Electric	2011	19	558	0.34	--	--	--	--
55	Baggage Tractor	Electric	2013	40	798	0.37	--	--	--	--
56	Belt Loader	Electric	2021	19	558	0.34	--	--	--	--
57	Aircraft Tractor	Electric	2022	200	358	0.54	--	--	--	--
58	Fork Lift	Electric	2014	53	412	0.20	--	--	--	--
59	Belt Loader	Electric	2013	19	558	0.34	--	--	--	--
60	Passenger Stand	Gasoline	2023	61	198	0.40	0.23	3.11	0.006	0.080

Table 4-4. JWA GSE List and Emissions for 2023 BAU
John Wayne Airport AQIP
Santa Ana, California

Row Number	GSE Type[1]	Fuel Type[1]	Engine Model Year[2]	Engine Rated HP[1]	Annual Hours 2023[3]	Load Factor[4]	ROG EF (g/bhp-hr)[4]	NOx EF (g/bhp-hr)[4]	ROG (lb/day)	NOx (lb/day)
61	Belt Loader	Electric	2021	19	558	0.34	--	--	--	--
62	Baggage Tractor	Electric	2005	93	798	0.37	--	--	--	--
63	Cargo Tractor	Gasoline	2021	101	1380	0.36	0.63	3.84	0.170	1.045
64	Baggage Tractor	Electric	2021	40	798	0.37	--	--	--	--
65	Baggage Tractor	Electric	2011	40	798	0.37	--	--	--	--
66	Baggage Tractor	Electric	2010	40	798	0.37	--	--	--	--
67	Belt Loader	Electric	2010	19	558	0.34	--	--	--	--
68	Baggage Tractor	Gasoline	2014	100	972	0.37	0.93	4.92	0.179	0.952
69	Cart	Electric	2013	7	1421	0.34	--	--	--	--
70	Belt Loader	Electric	2010	19	558	0.34	--	--	--	--
71	Belt Loader	Electric	2007	19	558	0.34	--	--	--	--
72	Baggage Tractor	Electric	2021	40	798	0.37	--	--	--	--
73	Baggage Tractor	Electric	2014	93	798	0.37	--	--	--	--
74	Baggage Tractor	Electric	2010	40	798	0.37	--	--	--	--
75	Baggage Tractor	Electric	2011	40	798	0.37	--	--	--	--
76	Baggage Tractor	Electric	2024	49	798	0.37	--	--	--	--
77	Baggage Tractor	Electric	2011	40	798	0.37	--	--	--	--
78	Passenger Stand	Electric	2010	19	52	0.40	--	--	--	--
79	Baggage Tractor	Electric	2024	40	798	0.37	--	--	--	--
80	Baggage Tractor	Electric	2024	40	798	0.37	--	--	--	--
81	Baggage Tractor	Electric	2024	49	798	0.37	--	--	--	--
82	Baggage Tractor	Electric	2011	40	798	0.37	--	--	--	--
83	Belt Loader	Electric	2021	19	558	0.34	--	--	--	--
84	Other	Gasoline	2004	260	204	0.34	1.76	4.75	0.168	0.456
85	Baggage Tractor	Electric	2024	40	798	0.37	--	--	--	--
86	Baggage Tractor	Electric	2024	49	798	0.37	--	--	--	--
87	Baggage Tractor	Electric	2011	40	798	0.37	--	--	--	--
88	Other	Gasoline	1996	138	204	0.34	7.88	13.55	0.400	0.689
89	Baggage Tractor	Electric	2011	40	798	0.37	--	--	--	--
90	Cart	Electric	2012	55	1421	0.34	--	--	--	--
91	Cargo Tractor	Gasoline	2008	124	1380	0.36	1.78	7.97	0.595	2.668
92	Baggage Tractor	Electric	2014	93	798	0.37	--	--	--	--
93	Catering Truck	Gasoline	2022	200	987	0.34	0.12	1.31	0.043	0.469
94	Belt Loader	Electric	2013	19	558	0.34	--	--	--	--
95	Cargo Loader	Gasoline	2021	102	854	0.34	0.50	3.37	0.078	0.530
96	Service Truck	Gasoline	2023	133	987	0.34	0.10	1.29	0.025	0.304
97	Baggage Tractor	Electric	2008	40	798	0.37	--	--	--	--
98	Cargo Tractor	Gasoline	2002	101	1380	0.36	10.71	23.24	2.914	6.321
99	Baggage Tractor	Electric	2021	40	798	0.37	--	--	--	--
100	Baggage Tractor	Electric	2024	49	798	0.37	--	--	--	--
101	Baggage Tractor	Electric	2010	40	798	0.37	--	--	--	--
102	Lift	Electric	2015	114	451	0.34	--	--	--	--
103	Cargo Tractor	Gasoline	2023	86	1380	0.36	0.45	3.21	0.104	0.744
104	Lavatory Truck	Gasoline	2006	250	1300	0.34	1.25	4.90	0.733	2.883
105	Lift	Electric	2011	59	451	0.34	--	--	--	--
106	Baggage Tractor	Electric	2024	40	798	0.37	--	--	--	--
107	Baggage Tractor	Electric	2006	93	798	0.37	--	--	--	--
108	Cargo Tractor	Gasoline	2021	101	1380	0.36	0.63	3.84	0.170	1.045
109	Belt Loader	Electric	2010	84	558	0.34	--	--	--	--
110	Belt Loader	Electric	2021	19	558	0.34	--	--	--	--
111	Cargo Tractor	Gasoline	2021	101	1380	0.36	0.63	3.84	0.170	1.045
112	Lavatory Truck	Gasoline	2006	65	1300	0.34	1.25	4.90	0.191	0.750
113	Baggage Tractor	Gasoline	2012	202	972	0.37	1.06	5.44	0.416	2.129
114	Lavatory Truck	Gasoline	2017	260	1300	0.34	0.31	1.96	0.192	1.199
115	Catering Truck	Gasoline	2023	362	987	0.34	0.10	1.29	0.067	0.831
116	Aircraft Tractor	Electric	2022	200	358	0.54	--	--	--	--
117	Baggage Tractor	Electric	2011	40	798	0.37	--	--	--	--
118	Cargo Tractor	Gasoline	2023	86	1380	0.36	0.45	3.21	0.104	0.744
119	Baggage Tractor	Electric	2011	40	798	0.37	--	--	--	--
120	Baggage Tractor	Electric	2024	40	798	0.37	--	--	--	--

Table 4-4. JWA GSE List and Emissions for 2023 BAU
John Wayne Airport AQIP
Santa Ana, California

Row Number	GSE Type[1]	Fuel Type[1]	Engine Model Year[2]	Engine Rated HP[1]	Annual Hours 2023[3]	Load Factor[4]	ROG EF (g/bhp-hr)[4]	NOx EF (g/bhp-hr)[4]	ROG (lb/day)	NOx (lb/day)
121	Cargo Tractor	Gasoline	2016	80	1380	0.36	1.07	5.43	0.231	1.172
122	Baggage Tractor	Electric	2010	40	798	0.37	--	--	--	--
123	Baggage Tractor	Electric	2024	40	798	0.37	--	--	--	--
124	Baggage Tractor	Electric	2014	93	798	0.37	--	--	--	--
125	Baggage Tractor	Electric	2024	40	798	0.37	--	--	--	--
126	Cargo Tractor	Gasoline	2016	80	1380	0.36	1.07	5.43	0.231	1.172
127	Baggage Tractor	Electric	2021	40	798	0.37	--	--	--	--
128	Service Truck	Electric	2024	7	519	0.34	--	--	--	--
129	Baggage Tractor	Electric	2011	40	798	0.37	--	--	--	--
130	Belt Loader	Gasoline	2010	84	878	0.34	1.04	5.26	0.140	0.705
131	Belt Loader	Electric	2007	19	558	0.34	--	--	--	--
132	Baggage Tractor	Electric	2011	40	798	0.37	--	--	--	--
133	Baggage Tractor	Electric	2010	93	798	0.37	--	--	--	--
134	Baggage Tractor	Electric	2007	93	798	0.37	--	--	--	--
135	Belt Loader	Electric	2007	19	558	0.34	--	--	--	--
136	BAG TUG	Electric	2011	40	798	0.37	--	--	--	--
137	BAG TUG	Electric	2011	40	798	0.37	--	--	--	--
138	BELT LOADER	Electric	2012	19	558	0.34	--	--	--	--
139	BELT LOADER	Electric	2012	19	558	0.34	--	--	--	--
140	PUSH BACK	Diesel	2014	100	358	0.54	0.14	2.23	0.014	0.231
141	AC TOW TRACTOR	Diesel	1986	101	358	0.54	1.17	12.93	0.123	1.355
142	PAX STAIRS	Diesel	2023	61	52	0.40	0.06	1.31	0.000	0.009
143	LAV TRUCK	Gasoline	2006	250	1300	0.34	1.25	4.90	0.733	2.883
144	BAG TRACTOR	Diesel	2017	85	798	0.37	0.13	1.41	0.018	0.191
145	BAG TRACTOR	Diesel	2017	85	798	0.37	0.13	1.41	0.018	0.191
146	BAG TRACTOR	Diesel	2017	85	798	0.37	0.13	1.41	0.018	0.191
147	BAG TRACTOR	Diesel	2017	85	798	0.37	0.13	1.41	0.018	0.191
148	BELT LOADER	Diesel	1997	55	558	0.34	1.34	10.40	0.075	0.578
149	BELT LOADER	Diesel	1997	55	558	0.34	1.34	10.40	0.075	0.578
150	BELT LOADER	Diesel	1997	55	558	0.34	1.34	10.40	0.075	0.578
151	AC TOW TRACTOR	Diesel	1986	101	358	0.54	1.17	12.93	0.123	1.355
152	AC TOW TRACTOR	Gasoline	1994	101	814	0.54	2.56	19.64	0.610	4.679
153	LAV CART	Gasoline	2019	250	136	0.34	5.31	4.46	0.327	0.275
154	AC TOW TRACTOR	Diesel	1986	101	358	0.54	1.17	12.93	0.123	1.355
155	BAG TRACTOR	Diesel	2017	85	798	0.37	0.13	1.41	0.018	0.191
156	MANUAL PAX STAIRS	Gasoline	2023	61	198	0.40	0.23	3.11	0.006	0.080
157	BELT LOADER	Gasoline	2010	84	878	0.34	1.04	5.26	0.140	0.705
158	BELT LOADER	Gasoline	2010	84	878	0.34	1.04	5.26	0.140	0.705
159	AC TOW TRACTOR	Electric	2007	110	358	0.54	--	--	--	--
160	BELT LOADER	Electric	2011	19	558	0.34	--	--	--	--
161	BAG TRACTOR	Electric	2011	40	798	0.37	--	--	--	--
162	BAG TRACTOR	Electric	2011	40	798	0.37	--	--	--	--
163	BAG TRACTOR	Electric	2011	40	798	0.37	--	--	--	--
164	Ground Power Unit	Diesel	2021	155	519	0.34	0.06	0.26	0.008	0.038
165	Air Start	Diesel	2023	600	1421	0.34	0.13	0.15	0.202	0.231
166	Ground Power Unit	Diesel	2003	181	519	0.34	0.30	4.58	0.050	0.780
167	Ground Power Unit	Diesel	2013	220	519	0.34	0.14	1.37	0.029	0.284
168	Ground Power Unit	Diesel	2003	500	519	0.34	0.30	4.58	0.139	2.154
169	Ground Power Unit	Diesel	2013	220	519	0.34	0.14	1.37	0.029	0.284
170	Ground Power Unit	Diesel	2012	173	519	0.34	0.18	2.30	0.029	0.374
171	Ground Power Unit	Diesel	2021	155	519	0.34	0.06	0.26	0.008	0.038
172	Ground Power Unit	Diesel	2007	194	519	0.34	0.25	2.55	0.046	0.465
173	Air Start	Diesel	2021	333	1421	0.34	0.09	0.12	0.075	0.104
174	Ground Power Unit	Diesel	2005	152	519	0.34	0.28	4.48	0.040	0.640
175	Ground Power Unit	Diesel	2004	152	519	0.34	0.30	4.95	0.043	0.708
176	Ground Power Unit	Diesel	2011	219	519	0.34	0.15	1.39	0.031	0.285
177	Air Start	Diesel	2013	665	1421	0.34	0.23	1.86	0.390	3.185
178	Air Start	Diesel	2005	330	1421	0.34	0.31	4.01	0.267	3.403
179	Ground Power Unit	Diesel	2004	152	519	0.34	0.30	4.95	0.043	0.708
180	Ground Power Unit	Diesel	2005	185	519	0.34	0.28	4.48	0.048	0.779

Table 4-4. JWA GSE List and Emissions for 2023 BAU
John Wayne Airport AQIP
Santa Ana, California

Row Number	GSE Type[1]	Fuel Type[1]	Engine Model Year[2]	Engine Rated HP[1]	Annual Hours 2023[3]	Load Factor[4]	ROG EF (g/bhp-hr)[4]	NOx EF (g/bhp-hr)[4]	ROG (lb/day)	NOx (lb/day)
181	Air Start	Diesel	2013	630	1421	0.34	0.23	1.86	0.369	3.017
182	GROUND POWER	Diesel	2003	181	519	0.34	0.30	4.58	0.050	0.780
183	AIR START	Diesel	2005	665	1421	0.34	0.32	3.89	0.543	6.647
184	GROUND POWER	Diesel	2003	181	519	0.34	0.30	4.58	0.050	0.780
								Total Emissions (lb/day)	**14**	**83**
							Fleet-averaged NOx EF (g/bhp-hr)	**2.7**		

Notes:

[1] List of GSEs including fuel type and engine horsepower are provided by A4A, Delta Airlines and Frontier Airlines for JWA. Nonmotorized equipment and on-road vehicles (e.g., pickup truck, van) were excluded from the provided inventory. Where horsepower data were not provided, data was back-filled based on typical parameters of similar equipment operating at JWA.

[2] Fleets are aged from the Baseline by increasing the model years of all equipment by 6 years (equal to the modeled future year, 2023, minus the baseline year, 2017) such that the average fleet-age remains the same as the Baseline year. If the OFFROAD2017 database did not contain an inventory of equipment for the exact model year and horsepower bin, the closest available model year and horsepower bin was used.

[3] Annual usage hours for 2023 were scaled up from the Baseline year by the ratio of ADDs forecast in EIR 617.

[4] Model year-specific emission factors from OFFROAD2017 were derived by dividing total emissions by the total annual horsepower-hours and load factor for each equipment type and horsepower bin. Electric vehicles are assigned an EF of 0. Emissions are calculated by multiplying the respective EFs by the equipment horsepower, load factor and hours of usage in 2023 and converted to an average daily emission rate assuming 365 days of operation.

Abbreviations:

ADD - Average Daily Departures	g - grams
BAU - business-as-usual	lb - pound
bhp - brake horsepower	NO_X - oxides of Nitrogen
EF - emission factor	ROG - reactive organic gases

Table 4-5. JWA GSE List and Emissions for 2031 BAU
John Wayne Airport AQIP
Santa Ana, California

Row Number	GSE Type[1]	Fuel Type[1]	Engine Model Year[2]	Engine Rated HP[1]	Annual Hours 2031[3]	Load Factor[4]	ROG EF (g/bhp-hr)[4]	NOx EF (g/bhp-hr)[4]	ROG (lb/day)	NOx (lb/day)
1	Belt Loader	Electric	2013	84	558	0.34	--	--	--	--
2	Aircraft Tractor	Diesel	2012	88	358	0.54	0.19	2.31	0.018	0.211
3	Belt Loader	Electric	1983	84	558	0.34	--	--	--	--
4	Aircraft Tractor	Diesel	1998	101	358	0.54	1.27	8.09	0.133	0.848
5	Belt Loader	Electric	2016	59	558	0.34	--	--	--	--
6	Cargo Loader	Diesel	2030	110	513	0.34	0.05	0.26	0.005	0.026
7	Aircraft Tractor	Diesel	2026	65	358	0.54	0.09	1.36	0.006	0.092
8	Aircraft Tractor	Diesel	2003	110	358	0.54	0.50	5.78	0.057	0.659
9	Belt Loader	Electric	2015	84	558	0.34	--	--	--	--
10	Aircraft Tractor	Diesel	2015	88	358	0.54	0.14	1.42	0.013	0.129
11	Belt Loader	Electric	2016	84	558	0.34	--	--	--	--
12	Belt Loader	Electric	2016	59	558	0.34	--	--	--	--
13	Belt Loader	Electric	2014	84	558	0.34	--	--	--	--
14	Baggage Tractor	Electric	1983	93	798	0.37	--	--	--	--
15	Cargo Loader	Diesel	2011	152	513	0.34	0.29	3.07	0.040	0.433
16	Belt Loader	Electric	2013	84	558	0.34	--	--	--	--
17	Aircraft Tractor	Electric	2015	110	358	0.54	--	--	--	--
18	Aircraft Tractor	Diesel	2024	175	358	0.54	0.07	0.26	0.012	0.048
19	Belt Loader	Electric	2015	84	558	0.34	--	--	--	--
20	Baggage Tractor	Electric	2015	93	798	0.37	--	--	--	--
21	Aircraft Tractor	Electric	2015	110	358	0.54	--	--	--	--
22	Aircraft Tractor	Diesel	2015	87	358	0.54	0.14	1.42	0.012	0.128
23	Aircraft Tractor	Diesel	2028	74	358	0.54	0.06	0.26	0.004	0.020
24	Belt Loader	Diesel	2004	55	558	0.34	0.75	6.52	0.042	0.362
25	Aircraft Tractor	Diesel	2014	100	358	0.54	0.18	2.30	0.019	0.238
26	Aircraft Tractor	Diesel	2023	110	358	0.54	0.09	0.85	0.010	0.097
27	Aircraft Tractor	Diesel	2028	74	358	0.54	0.06	0.26	0.004	0.020
28	Aircraft Tractor	Electric	2002	140	358	0.54	--	--	--	--
29	Baggage Tractor	Electric	1983	93	798	0.37	--	--	--	--
30	Belt Loader	Electric	1983	84	558	0.34	--	--	--	--
31	Cargo Loader	Diesel	2021	99	513	0.34	0.13	1.41	0.012	0.130
32	Aircraft Tractor	Diesel	2014	210	358	0.54	0.10	0.27	0.021	0.060
33	Aircraft Tractor	Electric	2015	110	358	0.54	--	--	--	--
34	Belt Loader	Electric	2016	84	558	0.34	--	--	--	--
35	Baggage Tractor	Electric	1983	93	798	0.37	--	--	--	--
36	Aircraft Tractor	Diesel	2008	210	358	0.54	0.24	2.54	0.053	0.553
37	Belt Loader	Electric	1983	84	558	0.34	--	--	--	--
38	Lift	Diesel	2026	67	451	0.34	0.10	1.37	0.005	0.075
39	Baggage Tractor	Diesel	2029	85	798	0.37	0.09	1.36	0.012	0.184
40	Cargo Loader	Diesel	2023	110	513	0.34	0.11	1.11	0.011	0.113
41	Aircraft Tractor	Diesel	2014	87	358	0.54	0.18	2.30	0.016	0.207
42	Baggage Tractor	Electric	2014	93	798	0.37	--	--	--	--
43	Aircraft Tractor	Diesel	2031	74	358	0.54	0.07	1.33	0.005	0.102
44	Baggage Tractor	Electric	1983	93	798	0.37	--	--	--	--
45	Lift	Diesel	2030	67	451	0.34	0.07	1.34	0.004	0.073
46	Baggage Tractor	Electric	2015	93	798	0.37	--	--	--	--
47	Baggage Tractor	Electric	2014	93	798	0.37	--	--	--	--
48	Belt Loader	Electric	2018	84	558	0.34	--	--	--	--
49	Belt Loader	Electric	2019	19	558	0.34	--	--	--	--
50	Cargo Tractor	Gasoline	2031	86	1380	0.36	0.45	3.20	0.104	0.744
51	Baggage Tractor	Gasoline	2020	107	972	0.37	1.02	5.23	0.212	1.084
52	Belt Loader	Electric	2015	19	558	0.34	--	--	--	--
53	Cargo Tractor	Gasoline	2024	80	1380	0.36	1.07	5.43	0.231	1.172
54	Belt Loader	Electric	2019	19	558	0.34	--	--	--	--
55	Baggage Tractor	Electric	2021	40	798	0.37	--	--	--	--
56	Belt Loader	Electric	2029	19	558	0.34	--	--	--	--
57	Aircraft Tractor	Electric	2030	200	358	0.54	--	--	--	--
58	Fork Lift	Electric	2022	53	412	0.20	--	--	--	--
59	Belt Loader	Electric	2021	19	558	0.34	--	--	--	--

Table 4-5. JWA GSE List and Emissions for 2031 BAU
John Wayne Airport AQIP
Santa Ana, California

Row Number	GSE Type[1]	Fuel Type[1]	Engine Model Year[2]	Engine Rated HP[1]	Annual Hours 2031[3]	Load Factor[4]	ROG EF (g/bhp-hr)[4]	NOx EF (g/bhp-hr)[4]	ROG (lb/day)	NOx (lb/day)
60	Passenger Stand	Gasoline	2031	61	198	0.40	0.22	3.05	0.006	0.079
61	Belt Loader	Electric	2029	19	558	0.34	--	--	--	--
62	Baggage Tractor	Electric	2013	93	798	0.37	--	--	--	--
63	Cargo Tractor	Gasoline	2029	101	1380	0.36	0.63	3.84	0.170	1.045
64	Baggage Tractor	Electric	2029	40	798	0.37	--	--	--	--
65	Baggage Tractor	Electric	2019	40	798	0.37	--	--	--	--
66	Baggage Tractor	Electric	2018	40	798	0.37	--	--	--	--
67	Belt Loader	Electric	2018	19	558	0.34	--	--	--	--
68	Baggage Tractor	Gasoline	2022	100	972	0.37	0.93	4.92	0.179	0.952
69	Cart	Electric	2021	7	1421	0.34	--	--	--	--
70	Belt Loader	Electric	2018	19	558	0.34	--	--	--	--
71	Belt Loader	Electric	2015	19	558	0.34	--	--	--	--
72	Baggage Tractor	Electric	2029	40	798	0.37	--	--	--	--
73	Baggage Tractor	Electric	2022	93	798	0.37	--	--	--	--
74	Baggage Tractor	Electric	2018	40	798	0.37	--	--	--	--
75	Baggage Tractor	Electric	2019	40	798	0.37	--	--	--	--
76	Baggage Tractor	Electric	2032	49	798	0.37	--	--	--	--
77	Baggage Tractor	Electric	2019	40	798	0.37	--	--	--	--
78	Passenger Stand	Electric	2018	19	52	0.40	--	--	--	--
79	Baggage Tractor	Electric	2032	40	798	0.37	--	--	--	--
80	Baggage Tractor	Electric	2032	40	798	0.37	--	--	--	--
81	Baggage Tractor	Electric	2032	49	798	0.37	--	--	--	--
82	Baggage Tractor	Electric	2019	40	798	0.37	--	--	--	--
83	Belt Loader	Electric	2029	19	558	0.34	--	--	--	--
84	Other	Gasoline	2012	260	204	0.34	1.67	4.04	0.160	0.387
85	Baggage Tractor	Electric	2032	40	798	0.37	--	--	--	--
86	Baggage Tractor	Electric	2032	49	798	0.37	--	--	--	--
87	Baggage Tractor	Electric	2019	40	798	0.37	--	--	--	--
88	Other	Gasoline	2004	138	204	0.34	2.58	7.21	0.131	0.366
89	Baggage Tractor	Electric	2019	40	798	0.37	--	--	--	--
90	Cart	Electric	2020	55	1421	0.34	--	--	--	--
91	Cargo Tractor	Gasoline	2016	124	1380	0.36	1.78	7.97	0.595	2.667
92	Baggage Tractor	Electric	2022	93	798	0.37	--	--	--	--
93	Catering Truck	Gasoline	2030	200	987	0.34	0.12	1.31	0.043	0.470
94	Belt Loader	Electric	2021	19	558	0.34	--	--	--	--
95	Cargo Loader	Gasoline	2029	102	854	0.34	0.50	3.39	0.078	0.532
96	Service Truck	Gasoline	2031	133	987	0.34	0.10	1.29	0.025	0.304
97	Baggage Tractor	Electric	2016	40	798	0.37	--	--	--	--
98	Cargo Tractor	Gasoline	2010	101	1380	0.36	2.19	9.37	0.596	2.549
99	Baggage Tractor	Electric	2029	40	798	0.37	--	--	--	--
100	Baggage Tractor	Electric	2032	49	798	0.37	--	--	--	--
101	Baggage Tractor	Electric	2018	40	798	0.37	--	--	--	--
102	Lift	Electric	2023	114	451	0.34	--	--	--	--
103	Cargo Tractor	Gasoline	2031	86	1380	0.36	0.45	3.20	0.104	0.744
104	Lavatory Truck	Gasoline	2014	250	1300	0.34	0.50	2.03	0.295	1.196
105	Lift	Electric	2019	59	451	0.34	--	--	--	--
106	Baggage Tractor	Electric	2032	40	798	0.37	--	--	--	--
107	Baggage Tractor	Electric	2014	93	798	0.37	--	--	--	--
108	Cargo Tractor	Gasoline	2029	101	1380	0.36	0.63	3.84	0.170	1.045
109	Belt Loader	Electric	2018	84	558	0.34	--	--	--	--
110	Belt Loader	Electric	2029	19	558	0.34	--	--	--	--
111	Cargo Tractor	Gasoline	2029	101	1380	0.36	0.63	3.84	0.170	1.045
112	Lavatory Truck	Gasoline	2014	65	1300	0.34	0.50	2.03	0.077	0.311
113	Baggage Tractor	Gasoline	2020	202	972	0.37	1.02	5.23	0.400	2.046
114	Lavatory Truck	Gasoline	2025	260	1300	0.34	0.31	1.96	0.193	1.201
115	Catering Truck	Gasoline	2031	362	987	0.34	0.10	1.29	0.067	0.831
116	Aircraft Tractor	Electric	2030	200	358	0.54	--	--	--	--
117	Baggage Tractor	Electric	2019	40	798	0.37	--	--	--	--
118	Cargo Tractor	Gasoline	2031	86	1380	0.36	0.45	3.20	0.104	0.744

Table 4-5. JWA GSE List and Emissions for 2031 BAU
John Wayne Airport AQIP
Santa Ana, California

Row Number	GSE Type[1]	Fuel Type[1]	Engine Model Year[2]	Engine Rated HP[1]	Annual Hours 2031[3]	Load Factor[4]	ROG EF (g/bhp-hr)[4]	NOx EF (g/bhp-hr)[4]	ROG (lb/day)	NOx (lb/day)
119	Baggage Tractor	Electric	2019	40	798	0.37	--	--	--	--
120	Baggage Tractor	Electric	2032	40	798	0.37	--	--	--	--
121	Cargo Tractor	Gasoline	2024	80	1380	0.36	1.07	5.43	0.231	1.172
122	Baggage Tractor	Electric	2018	40	798	0.37	--	--	--	--
123	Baggage Tractor	Electric	2032	40	798	0.37	--	--	--	--
124	Baggage Tractor	Electric	2022	93	798	0.37	--	--	--	--
125	Baggage Tractor	Electric	2032	40	798	0.37	--	--	--	--
126	Cargo Tractor	Gasoline	2024	80	1380	0.36	1.07	5.43	0.231	1.172
127	Baggage Tractor	Electric	2029	40	798	0.37	--	--	--	--
128	Service Truck	Electric	2032	7	519	0.34	--	--	--	--
129	Baggage Tractor	Electric	2019	40	798	0.37	--	--	--	--
130	Belt Loader	Gasoline	2018	84	878	0.34	1.10	5.55	0.148	0.745
131	Belt Loader	Electric	2015	19	558	0.34	--	--	--	--
132	Baggage Tractor	Electric	2019	40	798	0.37	--	--	--	--
133	Baggage Tractor	Electric	2018	93	798	0.37	--	--	--	--
134	Baggage Tractor	Electric	2015	93	798	0.37	--	--	--	--
135	Belt Loader	Electric	2015	19	558	0.34	--	--	--	--
136	BAG TUG	Electric	2019	40	798	0.37	--	--	--	--
137	BAG TUG	Electric	2019	40	798	0.37	--	--	--	--
138	BELT LOADER	Electric	2020	19	558	0.34	--	--	--	--
139	BELT LOADER	Electric	2020	19	558	0.34	--	--	--	--
140	PUSH BACK	Diesel	2022	100	358	0.54	0.07	0.27	0.008	0.028
141	AC TOW TRACTOR	Diesel	1989	101	358	0.54	0.92	9.71	0.097	1.017
142	PAX STAIRS	Diesel	2031	61	52	0.40	0.06	1.31	0.000	0.009
143	LAV TRUCK	Gasoline	2014	250	1300	0.34	0.50	2.03	0.295	1.196
144	BAG TRACTOR	Diesel	2029	85	798	0.37	0.09	1.36	0.012	0.184
145	BAG TRACTOR	Diesel	2029	85	798	0.37	0.09	1.36	0.012	0.184
146	BAG TRACTOR	Diesel	2029	85	798	0.37	0.09	1.36	0.012	0.184
147	BAG TRACTOR	Diesel	2029	85	798	0.37	0.09	1.36	0.012	0.184
148	BELT LOADER	Diesel	2004	55	558	0.34	0.75	6.52	0.042	0.362
149	BELT LOADER	Diesel	2004	55	558	0.34	0.75	6.52	0.042	0.362
150	BELT LOADER	Diesel	2004	55	558	0.34	0.75	6.52	0.042	0.362
151	AC TOW TRACTOR	Diesel	1989	101	358	0.54	0.92	9.71	0.097	1.017
152	AC TOW TRACTOR	Gasoline	2002	101	814	0.54	2.31	13.85	0.551	3.301
153	LAV CART	Gasoline	2027	250	136	0.34	6.05	5.09	0.373	0.313
154	AC TOW TRACTOR	Diesel	1989	101	358	0.54	0.92	9.71	0.097	1.017
155	BAG TRACTOR	Diesel	2029	85	798	0.37	0.09	1.36	0.012	0.184
156	MANUAL PAX STAIRS	Gasoline	2031	61	198	0.40	0.22	3.05	0.006	0.079
157	BELT LOADER	Gasoline	2018	84	878	0.34	1.10	5.55	0.148	0.745
158	BELT LOADER	Gasoline	2018	84	878	0.34	1.10	5.55	0.148	0.745
159	AC TOW TRACTOR	Electric	2015	110	358	0.54	--	--	--	--
160	BELT LOADER	Electric	2019	19	558	0.34	--	--	--	--
161	BAG TRACTOR	Electric	2019	40	798	0.37	--	--	--	--
162	BAG TRACTOR	Electric	2019	40	798	0.37	--	--	--	--
163	BAG TRACTOR	Electric	2019	40	798	0.37	--	--	--	--
164	Ground Power Unit	Diesel	2029	155	519	0.34	0.06	0.26	0.008	0.038
165	Air Start	Diesel	2031	600	1421	0.34	0.08	0.15	0.131	0.235
166	Ground Power Unit	Diesel	2011	181	519	0.34	0.21	1.45	0.036	0.246
167	Ground Power Unit	Diesel	2021	220	519	0.34	0.09	0.27	0.019	0.057
168	Ground Power Unit	Diesel	2011	500	519	0.34	0.21	1.45	0.099	0.679
169	Ground Power Unit	Diesel	2021	220	519	0.34	0.09	0.27	0.019	0.057
170	Ground Power Unit	Diesel	2020	173	519	0.34	0.10	0.28	0.016	0.045
171	Ground Power Unit	Diesel	2029	155	519	0.34	0.06	0.26	0.008	0.038
172	Ground Power Unit	Diesel	2015	194	519	0.34	0.12	0.28	0.022	0.052
173	Air Start	Diesel	2029	333	1421	0.34	0.10	0.13	0.083	0.114
174	Ground Power Unit	Diesel	2014	152	519	0.34	0.23	2.37	0.033	0.339
175	Ground Power Unit	Diesel	2012	152	519	0.34	0.25	2.40	0.035	0.342
176	Ground Power Unit	Diesel	2019	219	519	0.34	0.10	0.28	0.021	0.057
177	Air Start	Diesel	2021	665	1421	0.34	0.16	1.75	0.279	2.994
178	Air Start	Diesel	2013	330	1421	0.34	0.16	1.52	0.140	1.290

Table 4-5. JWA GSE List and Emissions for 2031 BAU
John Wayne Airport AQIP
Santa Ana, California

Row Number	GSE Type[1]	Fuel Type[1]	Engine Model Year[2]	Engine Rated HP[1]	Annual Hours 2031[3]	Load Factor[4]	ROG EF (g/bhp-hr)[4]	NOx EF (g/bhp-hr)[4]	ROG (lb/day)	NOx (lb/day)
179	Ground Power Unit	Diesel	2012	152	519	0.34	0.25	2.40	0.035	0.342
180	Ground Power Unit	Diesel	2021	185	519	0.34	0.09	0.27	0.016	0.048
181	Air Start	Diesel	2021	630	1421	0.34	0.16	1.75	0.265	2.837
182	GROUND POWER	Diesel	2011	181	519	0.34	0.21	1.45	0.036	0.246
183	AIR START	Diesel	2013	665	1421	0.34	0.25	2.03	0.425	3.474
184	GROUND POWER	Diesel	2011	181	519	0.34	0.21	1.45	0.036	0.246
Total Emissions (lb/day)									**9**	**55**
Fleet-averaged NOx EF (g/bhp-hr)									**1.7**	

[1] List of GSEs including fuel type and engine horsepower are provided by A4A, Delta Airlines and Frontier Airlines for JWA. Nonmotorized equipment and on-road vehicles (e.g., pickup truck, van) were excluded from the provided inventory. Where horsepower data were not provided, data was back-filled based on typical parameters of similar equipment operating at JWA.

[2] Fleets are aged from the Baseline by increasing the model years of all equipment by 14 years (equal to the modeled future year, 2031, minus the baseline year, 2017) such that the average fleet-age remains the same as the Baseline year. If the OFFROAD2017 database did not contain an inventory of equipment for the exact model year and horsepower bin, the closest available model year and horsepower bin was used.

[3] Annual usage hours for 2031 were scaled up from the Baseline year by the ratio of ADDs forecast in EIR 617.

[4] Model year-specific emission factors from OFFROAD2017 were derived by dividing total emissions by the total annual horsepower-hours and load factor for each equipment type and horsepower bin. Electric vehicles are assigned an EF of 0. Emissions are calculated by multiplying the respective EFs by the equipment horsepower, load factor and hours of usage in 2031 and converted to an average daily emission rate assuming 365 days of operation.

Abbreviations:

BAU - business-as-usual	g - grams
bhp - brake horsepower	lb - pound
EF - emission factor	NO_X - oxides of Nitrogen
	ROG - reactive organic gases

Table 4-6. GSE Emissions Summary
John Wayne Airport AQIP
Santa Ana, California

Scenario	JWA GSE			
	Exhaust Emissions (lb/day)		OFFROAD2017 Fleet-averaged NOx EF (g/hp-hr)[5]	Target Fleet-averaged NOx EF (g/hp-hr)
	ROG	NO_x		
Baseline (2017)[1]	19.9	122.1	4.0	--
Future BAU (2023)[2,3]	13.8	82.6	2.7	--
Improved Future (2023)[2,4]	10.6	56.3	--	1.7
Reductions (2023)	***3.2***	***26.3***	--	--
Future BAU (2031)[2,3]	9.0	54.7	1.7	--
Improved Future (2031)[2,4]	5.9	33.2	--	0.9
Reductions (2031)	***3.1***	***21.5***	--	--

Notes:

[1] Baseline emissions are calculated using JWA-specific GSE inventory provided by Airlines for America, Delta Airlines and Frontier Airlines. Nonmotorized equipment and on-road vehicles (e.g., pickup truck, van) were excluded from the provided inventory. Average usage hours/year was calculated from the OFFROAD2017 database for CY2017. Model year-specific emission factors from OFFROAD2017 were derived by dividing total emissions by the total annual horsepower-hours and load factor for each equipment type and horsepower bin and used to calculate emissions, with EF=0 for electric vehicles.

[2] Annual usage hours for future years were scaled up from the baseline year by the ratio of ADDs forecast in EIR 617.

[3] Future year business-as-usual (BAU) emissions are calculated based on model year-specific ROG and NOx EFs from the OFFROAD2017 database. Fleets are aged by increasing the model years of all equipment in the database by an amount equal to the modeled future year minus the baseline year such that the average fleet-age remains the same as the Baseline year. Emission factors were calculated for each equipment by dividing total emissions by the total annual horsepower-hours and load factor for each equipment type and horsepower bin in 2023 and 2031. If the OFFROAD2017 database did not contain an inventory of equipment for the exact horsepower bin, the closest available horsepower bin was used. Future-year BAU emissions are calculated by multiplying the respective EFs by the equipment horsepower, load factor and hours of usage in 2023 and 2031.

[4] Improved Future scenario emissions are calculated assuming the GSE fleet achieves the target fleet-averaged NOx EF in 2023 and 2031

[5] Fleet-average NOx EF was calculated via a weighted average of EFs weighted by engine horsepower, following the method used in CARB's In-Use Off-Road Diesel (ORD) rule.

Table 4-7. JWA Jet Fuel Delivery Truck Emissions

John Wayne Airport AQIP
Santa Ana, California

	Fuel Truck Emissions		
	Baseline (2017)	**Future (2023)**	**Future (2031)**
Trips per year[1, 2]	17,772	19,863	19,863
Trip distance (mi)[3]	31.9	31.9	31.9
Total VMT per year	566,934	633,632	633,632
NOx Emission factor (g/mile)[4]	5.90	2.44	2.18
ROG Emission factor (g/mile)[4]	0.25	0.026	0.021

	Running Exhaust Emissions (lb/day)	
Scenario	**NO_x**	**ROG**
Baseline (2017)	20.2	0.85
Future BAU (2023)	9.3	0.10
Improved Future (2023)	0	0
Reductions (2023)	***9.3***	***0.10***
Future BAU (2031)	8.3	0.082
Improved Future (2031)	0	0
Reductions (2031)	***8.3***	***0.082***

Notes:

[1] Baseline truck trips in 2017 are estimated using historical truck trips from 2010 and 2011 from "Initial Study for John Wayne Airport New Jet Fuel Pipeline and Tank Farm", December 2013. Historical truck trips are scaled up to the baseline year of 2017 using the number of annual commercial aircraft operations as published on the JWA website (https://www.ocair.com/newsroom/news/airportstats).

[2] Future year truck trips in 2023 and 2031 are estimated by scaling baseline trips by the Average Daily Departures (ADDs) for 2017, 2023 and 2031 published in EIR 617.

[3] Average round trip distance for fuel truck trips is based on the average miles driven by fuel delivery trucks to JWA over 2008-2011, obtained from "Initial Study for John Wayne Airport New Jet Fuel Pipeline and Tank Farm", December 2013.

[4] Fleet-averaged emission factors were obtained from EMFAC2017 for HHDT trucks.

Abbreviations:

BAU - business-as-usual
lb - pound
NO_X - oxides of Nitrogen
ROG - reactive organic gases
VMT - vehicle miles travelled

Table 4-8. JWA Concession Delivery Truck Emissions
John Wayne Airport AQIP
Santa Ana, California

	Nighttime Deliveries		
	Baseline (2017)	**Future (2023)**	**Future (2031)**
Number of annual delivery trips[1]	3,237	4,166	4,413
NOx Idling EF (g/idle-hr)[2]	45.4	31.2	25.8
ROG Idling EF (g/idle-hr)[2]	9.3	7.3	5.6
Idling duration per daytime trip (hr/trip)	0.25	0.25	0.25
Idling duration per nighttime trip (hr/trip)	--	0.083	0.083

Scenario	Running Exhaust Emissions (lb/day)	
	NO_x	**ROG**
Baseline (2017)	0.22	0.05
Future BAU (2023)	0.20	0.05
Improved Future (2023)	0.07	0.015
Reductions (2023)	***0.13***	***0.03***
Future BAU (2031)	0.17	0.04
Improved Future (2031)	0.06	0.012
Reductions (2031)	***0.11***	***0.02***

Notes:

[1] Baseline number of delivery trips is scaled up to future years using a ratio of million annual passengers (MAP) forecasted in EIR 617 from Phase 1 (for 2017) to Phase 2 (for 2023) and Phase 3 (for 2031).

[2] Idling emission rates are taken from EMFAC2017-PL for 2017, 2023 and 2031, aggregated by model year for Orange County and weighted by the number of trips of HHDT, LDT1/2, MHDT, OBUS and SBUS vehicle categories.

Abbreviations:

BAU - business-as-usual
lb - pound
NO_X - oxides of Nitrogen
ROG - reactive organic gases
VMT - vehicle miles travelled

Table 4-9. JWA On-Road Fleet Vehicles and Emissions
John Wayne Airport AQIP
Santa Ana, California

Year Make Model	Fuel Type	Annual Mileage	EMFAC CATEGORY	Baseline (2017)[1]		2023 BAU[2]		2031 BAU[2]	
				ROG	NOx	ROG	NOx	ROG	NOx
				Vehicle Emissions (g/year)	Vehicle Emissions (g/year)	Vehicle Emissions (g/year)	Vehicle Emissions (g/year)	Vehicle Emissions (g/year)	Vehicle Emissions (g/year)
2015 FORD C-MAX	GASOLINE	4,078.00	LDA	209	183	487	270	290	169
2010 FORD CROWN VIC	GASOLINE	10,020.02	LDA	481	451	717	572	388	352
2008 FORD CROWN VIC	GASOLINE	9,937.92	LDA	553	492	714	568	386	350
2011 FORD CROWN VIC	GASOLINE	20,884.10	LDA	787	871	1,138	1,126	567	687
2011 FORD CROWN VIC	GASOLINE	22,933.16	LDA	844	950	1,218	1,230	601	750
2011 FORD CROWN VIC	GASOLINE	23,303.78	LDA	855	965	1,232	1,249	607	762
2016 FORD ESCAPE	GASOLINE	6,102.00	LDT1	235	241	1,302	909	628	392
2015 FORD UTIL INTERCEPT	GASOLINE	16,789.45	MDV	700	748	2,051	2,307	1,068	992
2016 FORD UTIL INTERCEPT	GASOLINE	9,996.15	MDV	447	454	1,472	1,419	828	616
2016 FORD UTIL INTERCEPT	GASOLINE	14,513.74	MDV	586	628	1,857	2,010	987	866
2016 FORD UTIL INTERCEPT	GASOLINE	6,570.00	MDV	342	322	1,180	972	707	426
2003 FORD EXCURSION	GASOLINE	1,492.00	LDA	1,005	582	387	138	247	90
1999 DODG GRAND CARAVAN	GASOLINE	2,527.32	LDA	2,693	1,944	427	191	264	122
2017 FORD UTIL INTERCEPT	GASOLINE	9,707.45	MDV	421	438	1,447	1,382	818	600
2005 CHEV SUBURBAN	GASOLINE	1,419.00	LDA	410	133	384	134	246	88
2015 FORD F150	GASOLINE	3,117.00	MDV	256	196	886	520	586	235
2016 FORD F250	GASOLINE	2,100.79	MDV	205	149	799	387	550	179
2014 FORD F150	GASOLINE	6,733.72	MDV	401	349	1,194	993	713	435
2014 FORD F150	GASOLINE	2,106.66	MDV	243	157	800	388	550	179
1996 FORD RANGER	GASOLINE	3,856.00	LDA	11,044	7,671	478	258	286	163
2013 CHEV TAHOE	GASOLINE	16,858.40	LDA	548	640	982	921	501	563
2011 FORD F250	GASOLINE	5,954.39	MDV	458	319	1,127	891	686	392
1996 FORD F250	GASOLINE	5,094.80	MDV	7,506	11,432	1,054	779	655	344
2014 FORD F250	GASOLINE	3,956.24	MDV	306	234	957	630	615	281
2013 JEEP WRANGLER	GASOLINE	389.00	LDA	160	68	344	82	229	56
2016 FORD F250	GASOLINE	3,652.26	MDV	253	209	931	590	604	264
2015 FORD F250	GASOLINE	13,922.43	MDV	607	632	1,806	1,932	967	833
2015 FORD F250	GASOLINE	6,852.00	MDV	377	347	1,204	1,008	717	442
2016 FORD F350	GASOLINE	4,022.00	MDV	264	223	963	639	618	285

Table 4-9. JWA On-Road Fleet Vehicles and Emissions
John Wayne Airport AQIP
Santa Ana, California

Year Make Model	Fuel Type	Annual Mileage	EMFAC CATEGORY	Baseline (2017)[1]		2023 BAU[2]		2031 BAU[2]	
				ROG	NOx	ROG	NOx	ROG	NOx
				Vehicle Emissions (g/year)	Vehicle Emissions (g/year)	Vehicle Emissions (g/year)	Vehicle Emissions (g/year)	Vehicle Emissions (g/year)	Vehicle Emissions (g/year)
2014 FORD F350	GASOLINE	2,107.24	MDV	243	157	800	388	550	179
1999 FORD F250	GASOLINE	3,412.89	MDV	3,685	5,468	911	559	596	251
2013 FORD ESCAPE	GASOLINE	7,065.37	LDA	317	300	603	422	339	261
2015 FORD F350	GASOLINE	6,246.21	MDV	357	323	1,152	929	696	408
2013 FORD ESCAPE	GASOLINE	3,634.61	LDA	236	180	470	247	282	156
1999 FORD EXPLORER	GASOLINE	2,523.98	MDV	3,120	4,190	835	443	565	202
2013 FORD F350	GASOLINE	491.00	MDV	209	90	662	177	493	89
2011 FORD F250	GASOLINE	9,839.06	MDV	590	483	1,458	1,399	823	607
2012 FORD F250	GASOLINE	2,337.91	MDV	283	158	819	418	558	192
2014 FORD F250	GASOLINE	14,520.00	MDV	667	672	1,857	2,010	988	866
2014 FORD F250	GASOLINE	5,307.86	MDV	352	290	1,072	807	663	356
2012 Ford F350	GASOLINE	3,588.89	MDV	321	208	926	582	602	261
2012 Ford F250	GASOLINE	7,359.59	MDV	436	359	1,247	1,075	735	470
2014 FORD F250	GASOLINE	9,835.75	MDV	507	478	1,458	1,398	823	607
2012 FORD F250	GASOLINE	365.00	MDV	222	79	651	161	489	82
1989 GMC TR31003	GASOLINE	3,407.00	MDV	15,305	12,548	910	558	596	251
2011 Chevy Tahoe	DIESEL #2	6,426.42	MDV	1,248	893	973	742	685	426
2008 CHEV 2500	DIESEL #2	1,347.99	MDV	278	198	204	156	144	89
1990 GMC TC31003	GASOLINE	1,425.42	MDV	10,467	5,451	742	299	526	141
2003 Chevy S10	GASOLINE	2,052.59	MDV	1,978	1,790	795	381	548	176
2003 CHEV SILVERADO	GASOLINE	2,412.00	MDV	2,110	2,021	826	428	561	196
2003 CHEV S-10	GASOLINE	3,048.00	MDV	2,343	2,429	880	511	583	231
2009 DODG CARAVAN	GASOLINE	853.00	LDA	234	96	362	105	236	70
2007 Chevy C7500	DIESEL #2	229.15	MHDT	852	9,025	32	3,504	30	3,404
2005 OSHKOSH STI-3000	DIESEL #2	0	HHDT	1,388	17,940	1,539	20,376	1,567	20,054
2007 CHEV C7500	DIESEL #2	279.00	MHDT	1,022	9,817	34	3,785	32	3,707
2012 FORD F550	DIESEL #2	25.00	MHDT	20	1,971	23	2,354	21	2,162
2017 FORD F450	DIESEL #2	78.00	MHDT	26	2,406	26	2,653	23	2,484
2009 IHC 4300V SBA	DIESEL #2	4,550.79	HHDT	10,134	106,432	1,972	90,589	2,011	82,449

Table 4-9. JWA On-Road Fleet Vehicles and Emissions
John Wayne Airport AQIP
Santa Ana, California

				Baseline (2017)[1]		2023 BAU[2]		2031 BAU[2]	
				ROG	NOx	ROG	NOx	ROG	NOx
Year Make Model	Fuel Type	Annual Mileage	EMFAC CATEGORY	Vehicle Emissions (g/year)	Vehicle Emissions (g/year)	Vehicle Emissions (g/year)	Vehicle Emissions (g/year)	Vehicle Emissions (g/year)	Vehicle Emissions (g/year)
1992 GMC TC7H064	DIESEL #2	559.42	HHDT	2,597	40,529	1,592	29,007	1,622	27,724
2016 FORD F250	GASOLINE	920.00	MDV	169	104	698	233	508	113
2017 FORD F250	GASOLINE	1,152.00	MDV	166	113	718	263	516	126
2016 NISSAN LEAF	ELECTRIC	231.28	LDA	0	0	0	0	0	0
2016 NISSAN LEAF	ELECTRIC	231.28	LDA	0	0	0	0	0	0
2017 NISSAN LEAF	ELECTRIC	231.28	LDA	0	0	0	0	0	0
2017 NISSAN LEAF	ELECTRIC	223.82	LDA	0	0	0	0	0	0
2017 NISSAN LEAF	ELECTRIC	225.54	LDA	0	0	0	0	0	0
2017 NISSAN LEAF	ELECTRIC	244.48	LDA	0	0	0	0	0	0
			Total Emissions (g/yr)	**95,077**	**259,228**	**56,787**	**191,454**	**36,320**	**160,705**
			Total Emissions (lb/day)	**0.57**	**1.57**	**0.34**	**1.16**	**0.22**	**0.97**
			Fleet-average NOx Emission Factor (g/mile)	**0.75**		**0.55**		**0.46**	

Notes:

[1] Baseline emissions are calculated using JWA-specific vehicle inventory. Annual mileage were estimated based on 2013 data from EIR 617 if they were unavailable for 2017. Model year-specific emission factors from EMFAC2017 were used to calculate emissions from on-road vehicles. ROG due to evaporative processes, and ROG and NOx from resting and running losses were estimated for on-road vehicles assuming 1 trip per day and operation during 365 days over the year.

[2] The fleet-averaged emission factors from EMFAC2017 for calendar year 2023 and 2031 are used to calculate future year BAU emissions. Annual mileage in 2023 and 2031 are assumed to be the same as baseline mileage given that JWA does not have planned expansion of the Airport or airfield infrastructure at this time.

Abbreviations:

BAU - business-as-usual
lb - pound
EF - emission factor
g - grams
NO_X - oxides of Nitrogen
VMT - vehicle miles travelled
ROG - reactive organic gases
yr - year

Table 4-10. JWA Off-Road Fleet Vehicles and Emissions
John Wayne Airport AQIP
Santa Ana, California

Model Year	Make and Model	Unit Type	Horsepower	Fuel Type[3]	2017 Hours	OFFROAD CATEGORY	Baseline (2017)[1] ROG Vehicle Emissions (g/year)	Baseline (2017)[1] NOx Vehicle Emissions (g/year)	2023 BAU[2] ROG Vehicle Emissions (g/year)	2023 BAU[2] NOx Vehicle Emissions (g/year)	2031 BAU[2] ROG Vehicle Emissions (g/year)	2031 BAU[2] NOx Vehicle Emissions (g/year)
2001	DEER 4200	Lawnmower - Riding	26.3	DIESEL #2	9.00	Industrial - Other General Industrial Equipment	259	520	49	323	29	272
1998	DEER 6410MWWD	Loader - Front	104	DIESEL #2	92.00	ConstMin - Tractors/Loaders/Backhoes	3,004	27,970	651	5,378	486	2,651
2003	BCAT NS300	Loader - Front, Bobcat	81	DIESEL #2	44.00	ConstMin - Tractors/Loaders/Backhoes	1,593	10,337	296	3,044	213	2,150
2006	MANITOU MLT523	Forklift	75	DIESEL #2	169.00	Industrial - Forklifts	918	13,572	806	7,594	499	4,666
2010	GENIE BOOM Z-80/60	Crane	74	DIESEL #2	29.00	ConstMin - Cranes	106	1,778	337	2,999	195	1,742
2011	ADVANCED CY5000	Street Sweeper	66	DIESEL #2	19.43	ConstMin - Sweepers/Scrubbers	144	2,913	443	2,410	255	2,064
2001	LBLT RTC8040	Crane - Self Propelled	165	DIESEL #2	127.00	ConstMin - Cranes	4,845	46,463	2,559	25,411	1,589	12,943
2007	HUSQVARNA Z4824	Lawnmower - riding	26	GASOLINE	15.00	OFF - Industrial - Other General Industrial Equipment	348	876	223	534	223	535
1991	JLG 45HA	Manlift	45	PROPANE	29.00	Industrial - Aerial Lifts	1,209	2,860	65	1,164	59	1,148
1991	TCM FG15	Forklift	60	PROPANE	64.00	Industrial - Forklifts	1,045	8,093	244	2,301	151	1,414
2012	T3 MOTION T3-001-001-10B	3-Wheel Sherriff		ELECTRIC		--	0	0	0	0	0	0
2008	LEKTRO AP8750CX	Ground Support Equipment - Tug		ELECTRIC		--	0	0	0	0	0	0
2002	DODG GEMS	2-person golf cart style		ELECTRIC		--	0	0	0	0	0	0
2003	DODG GEMS	2-person golf cart style		ELECTRIC		--	0	0	0	0	0	0
2003	DODG GEMS	2-person golf cart style		ELECTRIC		--	0	0	0	0	0	0
2005	TAYLOR DUNN B2-10	Ground Support Equipment - Truck		ELECTRIC		--	0	0	0	0	0	0
2006	TAYLOR DUNN ET3000-GT	Ground Support Equipment Tus		ELECTRIC		--	0	0	0	0	0	0
1999	E-Z GO L299			ELECTRIC		--	0	0	0	0	0	0
2012	COLUMBIA EX21-F			ELECTRIC		--	0	0	0	0	0	0
2012	GEM E2	2-person golf cart style		ELECTRIC		--	0	0	0	0	0	0
2010	T3 MOTION T3-001-001-10B	3-Wheel Sherriff		ELECTRIC		--	0	0	0	0	0	0
1990	TVAC --	ELECTRIC TRUCK		ELECTRIC		--	0	0	0	0	0	0
1990	TVAC --	ELECTRIC TRUCK		ELECTRIC		--	0	0	0	0	0	0
2013	GENIE GS-1930			ELECTRIC		--	0	0	0	0	0	0

Table 4-10. JWA Off-Road Fleet Vehicles and Emissions
John Wayne Airport AQIP
Santa Ana, California

Model Year	Make and Model	Unit Type	Horsepower	Fuel Type[3]	2017 Hours	OFFROAD CATEGORY	Baseline (2017)[1]		2023 BAU[2]		2031 BAU[2]	
							ROG	NOx	ROG	NOx	ROG	NOx
							Vehicle Emissions (g/year)	Vehicle Emissions (g/year)	Vehicle Emissions (g/year)	Vehicle Emissions (g/year)	Vehicle Emissions (g/year)	Vehicle Emissions (g/year)
2013	GENIE GS-1930			ELECTRIC		--	0	0	0	0	0	0
2005	TAYLOR DUNN ET-015-74			ELECTRIC		--	0	0	0	0	0	0
2007	GEM E4	4 - person golf cart style		ELECTRIC		--	0	0	0	0	0	0
2007	GEM E4	4 - person golf cart style		ELECTRIC		--	0	0	0	0	0	0
2007	GEM E4	4 - person golf cart style		ELECTRIC		--	0	0	0	0	0	0
2014	CLAR TMX12	FORKLIFT		ELECTRIC		--	0	0	0	0	0	0
2016	GEM E4	ELECTRIC VEHICLE		ELECTRIC		--	0	0	0	0	0	0
Total Emissions (g/yr)							**13,472**	**115,384**	**5,674**	**51,157**	**3,700**	**29,585**
Total Emissions (lb/day)							**0.08**	**0.70**	**0.03**	**0.31**	**0.02**	**0.18**

Notes:

[1] Baseline emissions are calculated using JWA-specific equipment inventory. Annual equipment usage hours were estimated based on 2013 data from EIR 617 if they were unavailable for 2017. Model-year specific emission factors were calculated from the OFFROAD2017 database by dividing total emissions by total horsepower-hours for each equipment-type, fuel and horsepower bin and used to calculate emissions from off-road vehicles.
[2] The fleet-averaged emission factors from OFFROAD2017 for calendar year 2023 and 2031 are used to calculate future year BAU emissions. Annual hours of usage in 2023 and 2031 are assumed to be the same as baseline hours of usage given that JWA does not have planned expansion of the Airport or airfield infrastructure at this time.
[3] Diesel emission factors were conservatively assumed for propane-fueled equipment.

Abbreviations:

BAU - business-as-usual
lb - pound
EF - emission factor
g - grams
NO_X - oxides of Nitrogen
VMT - vehicle miles travelled
ROG - reactive organic gases

Table 4-11. JWA On-Road Improved Fleet Vehicles and Emissions
John Wayne Airport AQIP
Santa Ana, California

Year Make Model[2]	Annual Mileage	EMFAC CATEGORY	2023 Improvement[1] Assumed Fuel Type (2023)	2023 Improvement[1] ROG Vehicle Emissions (g/year)	2023 Improvement[1] NOx Vehicle Emissions (g/year)	2031 Improvement[1] Assumed Fuel Type (2031)	2031 Improvement[1] ROG Vehicle Emissions (g/year)	2031 Improvement[1] NOx Vehicle Emissions (g/year)
2015 FORD C-MAX†	4,078.00	LDA	GASOLINE	487	270	ELECTRIC	0	0
2010 FORD CROWN VIC	10,020.02	LDA	GASOLINE	717	572	GASOLINE	388	352
2008 FORD CROWN VIC	9,937.92	LDA	GASOLINE	714	568	GASOLINE	386	350
2011 FORD CROWN VIC	20,884.10	LDA	GASOLINE	1,138	1,126	GASOLINE	567	687
2011 FORD CROWN VIC	22,933.16	LDA	GASOLINE	1,218	1,230	GASOLINE	601	750
2011 FORD CROWN VIC	23,303.78	LDA	GASOLINE	1,232	1,249	GASOLINE	607	762
2016 FORD ESCAPE	6,102.00	LDT1	GASOLINE	1,302	909	GASOLINE	628	392
2015 FORD UTIL INTERCEPT	16,789.45	MDV	GASOLINE	2,051	2,307	GASOLINE	1,068	992
2016 FORD UTIL INTERCEPT	9,996.15	MDV	GASOLINE	1,472	1,419	GASOLINE	828	616
2016 FORD UTIL INTERCEPT	14,513.74	MDV	GASOLINE	1,857	2,010	GASOLINE	987	866
2016 FORD UTIL INTERCEPT	6,570.00	MDV	GASOLINE	1,180	972	GASOLINE	707	426
2003 FORD EXCURSION	1,492.00	LDA	GASOLINE	387	138	GASOLINE	247	90
1999 DODG GRAND CARAVAN*	2,527.32	LDA	ELECTRIC	0	0	ELECTRIC	0	0
2017 FORD UTIL INTERCEPT	9,707.45	MDV	GASOLINE	1,447	1,382	GASOLINE	818	600
2005 CHEV SUBURBAN	1,419.00	LDA	GASOLINE	384	134	GASOLINE	246	88
2015 FORD F150†	3,117.00	MDV	GASOLINE	886	520	ELECTRIC	0	0
2016 FORD F250†	2,100.79	MDV	GASOLINE	799	387	ELECTRIC	0	0
2014 FORD F150†	6,733.72	MDV	GASOLINE	1,194	993	ELECTRIC	0	0
2014 FORD F150†	2,106.66	MDV	GASOLINE	800	388	ELECTRIC	0	0
1996 FORD RANGER	3,856.00	LDA	GASOLINE	478	258	GASOLINE	286	163
2013 CHEV TAHOE	16,858.40	LDA	GASOLINE	982	921	GASOLINE	501	563
2011 FORD F250†	5,954.39	MDV	GASOLINE	1,127	891	ELECTRIC	0	0
1996 FORD F250	5,094.80	MDV	GASOLINE	1,054	779	GASOLINE	655	344
2014 FORD F250†	3,956.24	MDV	GASOLINE	957	630	ELECTRIC	0	0
2013 JEEP WRANGLER	389.00	LDA	GASOLINE	344	82	GASOLINE	229	56
2016 FORD F250†	3,652.26	MDV	GASOLINE	931	590	ELECTRIC	0	0
2015 FORD F250†	13,922.43	MDV	GASOLINE	1,806	1,932	ELECTRIC	0	0
2015 FORD F250†	6,852.00	MDV	GASOLINE	1,204	1,008	ELECTRIC	0	0
2016 FORD F350	4,022.00	MDV	GASOLINE	963	639	GASOLINE	618	285

Table 4-11. JWA On-Road Improved Fleet Vehicles and Emissions
John Wayne Airport AQIP
Santa Ana, California

			2023 Improvement[1]			2031 Improvement[1]		
				ROG	NOx		ROG	NOx
Year Make Model[2]	Annual Mileage	EMFAC CATEGORY	Assumed Fuel Type (2023)	Vehicle Emissions (g/year)	Vehicle Emissions (g/year)	Assumed Fuel Type (2031)	Vehicle Emissions (g/year)	Vehicle Emissions (g/year)
2014 FORD F350	2,107.24	MDV	GASOLINE	800	388	GASOLINE	550	179
1999 FORD F250*	3,412.89	MDV	ELECTRIC	0	0	ELECTRIC	0	0
2013 FORD ESCAPE	7,065.37	LDA	GASOLINE	603	422	GASOLINE	339	261
2015 FORD F350	6,246.21	MDV	GASOLINE	1,152	929	GASOLINE	696	408
2013 FORD ESCAPE	3,634.61	LDA	GASOLINE	470	247	GASOLINE	282	156
1999 FORD EXPLORER	2,523.98	MDV	GASOLINE	835	443	GASOLINE	565	202
2013 FORD F350	491.00	MDV	GASOLINE	662	177	GASOLINE	493	89
2011 FORD F250†	9,839.06	MDV	GASOLINE	1,458	1,399	ELECTRIC	0	0
2012 FORD F250†	2,337.91	MDV	GASOLINE	819	418	ELECTRIC	0	0
2014 FORD F250†	14,520.00	MDV	GASOLINE	1,857	2,010	ELECTRIC	0	0
2014 FORD F250†	5,307.86	MDV	GASOLINE	1,072	807	ELECTRIC	0	0
2012 Ford F350	3,588.89	MDV	GASOLINE	926	582	GASOLINE	602	261
2012 Ford F250†	7,359.59	MDV	GASOLINE	1,247	1,075	ELECTRIC	0	0
2014 FORD F250†	9,835.75	MDV	GASOLINE	1,458	1,398	ELECTRIC	0	0
2012 FORD F250	365.00	MDV	GASOLINE	651	161	GASOLINE	489	82
1989 GMC TR31003	3,407.00	MDV	GASOLINE	910	558	GASOLINE	596	251
2011 Chevy Tahoe	6,426.42	MDV	DIESEL #2	973	742	DIESEL #2	685	426
2008 CHEV 2500	1,347.99	MDV	DIESEL #2	204	156	DIESEL #2	144	89
1990 GMC TC31003	1,425.42	MDV	GASOLINE	742	299	GASOLINE	526	141
2003 Chevy S10*	2,052.59	MDV	ELECTRIC	0	0	ELECTRIC	0	0
2003 CHEV SILVERADO	2,412.00	MDV	GASOLINE	826	428	GASOLINE	561	196
2003 CHEV S-10	3,048.00	MDV	GASOLINE	880	511	GASOLINE	583	231
2009 DODG CARAVAN†	853.00	LDA	GASOLINE	362	105	ELECTRIC	0	0
2007 Chevy C7500	229.15	MHDT	DIESEL #2	32	3,504	DIESEL #2	30	3,404
2005 OSHKOSH STI-3000	0	HHDT	DIESEL #2	1,539	20,376	DIESEL #2	1,567	20,054
2007 CHEV C7500	279.00	MHDT	DIESEL #2	34	3,785	DIESEL #2	32	3,707
2012 FORD F550	25.00	MHDT	DIESEL #2	23	2,354	DIESEL #2	21	2,162
2017 FORD F450	78.00	MHDT	DIESEL #2	26	2,653	DIESEL #2	23	2,484
2009 IHC 4300V SBA	4,550.79	HHDT	DIESEL #2	1,972	90,589	DIESEL #2	2,011	82,449

Table 4-11. JWA On-Road Improved Fleet Vehicles and Emissions
John Wayne Airport AQIP
Santa Ana, California

Year Make Model[2]	Annual Mileage	EMFAC CATEGORY	2023 Improvement[1]			2031 Improvement[1]		
			Assumed Fuel Type (2023)	ROG Vehicle Emissions (g/year)	NOx Vehicle Emissions (g/year)	Assumed Fuel Type (2031)	ROG Vehicle Emissions (g/year)	NOx Vehicle Emissions (g/year)
1992 GMC TC7H064	559.42	HHDT	DIESEL #2	1,592	29,007	DIESEL #2	1,622	27,724
2016 FORD F250†	920.00	MDV	GASOLINE	698	233	ELECTRIC	0	0
2017 FORD F250†	1,152.00	MDV	GASOLINE	718	263	ELECTRIC	0	0
2016 NISSAN LEAF	231.28	LDA	ELECTRIC	0	0	ELECTRIC	0	0
2016 NISSAN LEAF	231.28	LDA	ELECTRIC	0	0	ELECTRIC	0	0
2017 NISSAN LEAF	231.28	LDA	ELECTRIC	0	0	ELECTRIC	0	0
2017 NISSAN LEAF	223.82	LDA	ELECTRIC	0	0	ELECTRIC	0	0
2017 NISSAN LEAF	225.54	LDA	ELECTRIC	0	0	ELECTRIC	0	0
2017 NISSAN LEAF	244.48	LDA	ELECTRIC	0	0	ELECTRIC	0	0
Total Emissions (g/yr)				**54,654**	**190,323**		**22,784**	**153,339**
Total Emissions (lb/day)				**0.33**	**1.15**		**0.14**	**0.93**
Fleet-average NOx Emission factor (g/mile)			**0.55**			**0.44**		

Notes:

[1] Annual mileage in 2023 and 2031 are assumed to be the same as baseline mileage given that JWA does not have planned expansion of the Airport or airfield infrastructure at this time. The fleet-averaged emission factors from the EMFAC2017 for calendar year 2023 and 2031 are used to calculate emissions. ROG due to evaporative processes, and ROG and NOx from resting and running losses were estimated for on-road vehicles assuming 1 trip per day and operation during 365 days over the year.

[2] JWA fleet improvements involve replacing existing vehicles with new electric, alternative fuel or hybrid vehicles. For the purposes of the AQIP inventory, these vehicles are assumed to be replaced with electric vehicles. The vehicles assumed to be replaced in 2023 are marked with an asterisk, while those assumed to be replaced in 2031 are indicated with a dagger symbol.

Abbreviations:

BAU - business-as-usual
lb - pound
EF - emission factor
g - grams
NO_X - oxides of Nitrogen
VMT - vehicle miles travelled
ROG - reactive organic gases
yr - year

Table 4-12. JWA Fleet On-Road Vehicles and Off-Road Equipment Emissions Summary
John Wayne Airport AQIP
Santa Ana, California

Scenario	JWA Fleet - On-Road Vehicles Running and Evaporative Emissions (lb/day) ROG	 NO_x
Baseline (2017)[1]	0.57	1.57
Future BAU (2023)[2]	0.34	1.16
Improved Future (2023)[3]	0.33	1.15
Reductions (2023)	***0.01***	***0.01***
Future BAU (2031)[2]	0.22	0.97
Improved Future (2031)[3]	0.14	0.93
Reductions (2031)	***0.08***	***0.04***

Scenario	JWA Fleet - Off-Road Equipment Running Exhaust Emissions (lb/day) ROG	 NO_x
Baseline (2017)[1]	0.08	0.70
Future BAU (2023)[2]	0.03	0.31
Improved Future (2023)[3]	0.03	0.31
Reductions (2023)	***0***	***0***
Future BAU (2031)[2]	0.02	0.18
Improved Future (2031)[3]	0.02	0.18
Reductions (2031)	***0***	***0***

Notes:

[1] Baseline emissions are calculated using JWA-specific vehicle and equipment inventory. Annual mileage and equipment usage hours were estimated based on 2013 data from EIR617 if they were unavailable for 2017. Portable and stationary equipment were excluded from the inventory. Model year-specific emission factors from EMFAC2017 were used to calculate emissions from on-road vehicles. Model-year specific emission factors were calculated from the OFFROAD2017 database by dividing total emissions by total horsepower-hours for each equipment-type, fuel and horsepower bin and used to calculate emissions from off-road vehicles. Diesel emission factors were conservatively assumed for propane-fueled equipment. ROG due to evaporative processes, resting and running losses were estimated for on-road vehicles assuming 1 trip per day and operation during 365 days over the year.

[2] Future year emissions were estimated using fleet-averaged emission factors from the EMFAC2017 and OFFROAD2017 databases for calendar years 2023 and 2031. Annual mileage and usage hours in 2023 and 2031 are assumed to be the same as baseline mileage given that JWA does not have planned expansion of the Airport or airfield infrastructure at this time.

[3] JWA fleet improvements involve replacing existing vehicles with new electric, alternative fuel or hybrid vehicles. JWA fleet improvements involve replacing existing vehicles with new electric, alternative fuel or hybrid vehicles. For the purposes of the AQIP inventory, these vehicles are assumed to be replaced with electric vehicles. No improvement beyond BAU is assumed for off-road equipment.

Table 4-13. JWA Shuttle Bus Emissions
John Wayne Airport AQIP
Santa Ana, California

	JWA Shuttle Bus emissions		
	Baseline (2017)	**Future (2023)**	**Future (2031)**
Annual Average Shuttle Bus VMT[1]	594,000	649,000	687,500
NOx Emission factor (g/mile)[2]	0.46	0.46	0.46
ROG Emission factor (g/mile)[2]	0.09	0.09	0.09

Scenario	Shuttle Bus Fleet (Number of Buses)		Running Exhaust Emissions (lb/day)[3]	
	CNG	**Electric**	**ROG**	**NO_x**
Baseline (2017)	12	0	0.31	1.65
Future BAU (2023)	12	0	0.34	1.79
Improved Future (2023)	6	6	0.17	0.90
Reductions (2023)	--	--	***0.17***	***0.90***
Future BAU (2031)	12	0	0.36	1.90
Improved Future (2031)	2	10	0.06	0.32
Reductions (2031)	--	--	***0.30***	***1.58***

Notes:

[1] Annual Shuttle Bus VMT in 2017 is provided by LAZ Parking. VMT in 2023 and 2031 is scaled based on projected increases in MAP relative to 2017.

[2] Exhaust Emission Factors are obtained from EMFAC2017 assuming a vehicle category of Urban Bus with CNG fuel and an average travel speed of 25 mph. Shuttle buses for calendar year 2017 are model year 2017 based on information provided by JWA. Model year is aggregated for calendar years 2023 and 2031. Idling, starting, hotsoak, running, resting and diurnal loss emission factors were zero in EMFAC2017 for Urban Bus.

[3] Criteria Air Pollutant Emissions in lb/day are calculated assuming 365 days of operation per year.

Abbreviations:

CAP - criteria air pollutant
CNG - compressed natural gas
EMFAC - California Air Resources Board Emissions Factor Model
g - gram
lb - pound
MAP - millions of annual passengers
mph - miles per hour
NO_X - oxides of nitrogen
PM_{10} - particulate matter equal to or less than 10 microns in diameter
$PM_{2.5}$ - particulate matter equal to or less than 2.5 microns in diameter
ROG - Reactive organic gas
VMT - vehicle miles traveled

Table 4-14. Construction Equipment Emission Factors
John Wayne Airport AQIP
Santa Ana, California

Off-Road Equipment Emission Factors[1]						
	Baseline (2017) EF (g/hp-hr)		Future (2023) EF (g/hp-hr)		Future (2031) EF (g/hp-hr)	
HP Bin	NO_X	VOC	NO_X	VOC	NO_X	VOC
25	2.336	1.017	2.046	0.681	1.836	0.397
50	1.971	0.438	1.523	0.240	1.337	0.161
75	1.759	0.174	1.138	0.110	0.923	0.089
100	1.874	0.198	1.000	0.100	0.677	0.068
175	1.922	0.183	0.866	0.099	0.390	0.065
300	1.806	0.142	0.863	0.086	0.399	0.063
600	1.656	0.135	0.749	0.082	0.384	0.065
750	1.690	0.144	0.856	0.096	0.424	0.074

Tier 4 Equipment EF (g/bhp-hr)[2]		
HP	NO_X	VOC
> 25	--	--
> 50	2.750	0.120
> 75	2.740	0.120
> 120	0.260	0.060
> 175	0.260	0.060
> 300	0.260	0.060
> 600	0.260	0.060
> 750	0.260	0.060

Percent Difference in EF[3]				
	Future (2023)		Future (2031)	
HP Bin	NO_X	VOC	NO_X	VOC
25	--	--	--	--
50	81%	-50%	106%	-25%
75	141%	10%	197%	35%
100	-74%	-40%	-62%	-11%
175	-70%	-39%	-33%	-8%
300	-70%	-30%	-35%	-4%
600	-65%	-26%	-32%	-7%
750	-70%	-37%	-39%	-19%

Notes:

[1] Exhaust emission factors based on OFFROAD 2017 model run for "construction and mining" equipment fleet in Orange County.

[2] Tier 4 Final emission factor obtained from CalEEMod User's Guide, Appendix D, Table 3.5.

[3] Percent difference in emission factors calculated as the difference between Tier 4 equipment EF and the fleet-averaged EFs in Orange County for the corresponding calendar year.

Abbreviations:

CalEEMod - CALifornia Emissions Estimator MODel
EF - emission factor
g - grams
hr - hour
HP - horse power
NO_X - nitrous oxide
VOC - volatile organic compounds

Table 4-15. Idling Emission Factors for Parking Lot Vehicles
John Wayne Airport AQIP
Santa Ana, California

Idling Exhaust Emission Factors[1]						
	Baseline (2017) EF (g/hr)		Future (2023) EF (g/hr)		Future (2031) EF (g/hr)	
Vehicle Speed	ROG	NO_X	ROG	NO_X	ROG	NO_X
5 mph / 10 mph	1.51	2.65	1.15	1.91	0.97	1.59

Notes:

[1] Idling exhaust emission factors (for the average fleet mix in Orange County) obtained from EIR 617. Baseline (2017) factors based on emission factors for CY 2016, Future (2023) factors based on emission factors for CY 2021, and Future (2031) factors based on emission factors for CY 2026.

Abbreviations:

CY - calendar year
EF - emission factor
g - grams
hr - hour
mph - miles per hour
NO_X - oxides of Nitrogen
ROG - reactive organic gases

Table 4-16. Parking Lot Vehicle Emissions
John Wayne Airport AQIP
Santa Ana, California

Parking Area	Average Daily Trips[1]		
	Baseline	**Future (2023)**	**Future (2031)**
Structure A1	541	591	626
Structure A2	749	818	867
Structure B2	889	971	1,029
Structure C	712	778	824
Main Street Lot	385	421	446
Employee Lot	1,002	1,095	1,160
Total	**4,278**	**4,674**	**4,952**

Idling time per vehicle[2]:	3	minutes
IMPROVEMENT - Idling time reduction per vehicle due to ***Smart Parking Features***[3] :	1.5	minutes

Scenario	Idling Exhaust Emissions (lb/day)	
	ROG	**NO_X**
Baseline (2017)	0.71	1.25
BAU Future (2023)	0.59	0.98
Improved Future (2023)	0.30	0.49
Reduction (2023)	***0.30***	***0.49***
BAU Future (2031)	0.53	0.87
Improved Future (2031)	0.26	0.43
Reduction (2031)	***0.26***	***0.43***

Notes:

[1] Baseline average daily trips for each parking area obtained from JWA data for August 2018. Average daily trips for Future (2023) and Future (2031) scaled based on MAP.

[2] Idling time of 3 minutes per vehicle in JWA's parking lots is consistent with the assumption used in EIR 617.

[3] It is assumed that *Smart Parking Features* will reduce idling time to half due to availability of *on-foot payment station.*

Abbreviations:

BAU - business-as-usual
lb - pound
NO_X - oxides of Nitrogen
ROG - reactive organic gases

Table 4-17. Running Exhaust Emission Factors for Light and Medium Duty Vehicles
John Wayne Airport AQIP
Santa Ana, California

Running Exhaust Emission Factors[1]						
	Baseline (2017) EF (g/mile)		Future (2023) EF (g/mile)		Future (2031) EF (g/mile)	
Vehicle Category	**ROG**	**NO_x**	**ROG**	**NO_x**	**ROG**	**NO_x**
Light and Medium Duty Vehicles	0.03	0.11	0.01	0.04	0.004	0.02

Notes:
[1] Running exhaust emission factors (for vehicle categories - LDA, LDT1, LDT2, and MDV) obtained from EMFAC2017 for CY 2017 for Baseline scenario, and CY 2023 and CY 2031 for Future scenarios.

Abbreviations:
CY - calendar year
EF - emission factor
g - grams
LDA - light duty vehicle
LTD1/LDT2 - light duty trucks
MDV - medium duty vehicle
NO_X - oxides of Nitrogen
ROG - reactive organic gases

Table 4-18. Emissions from Passenger Vehicles using Cell Phone Lot
John Wayne Airport AQIP
Santa Ana, California

Scenario	Average Daily Vehicle Trips		
	Baseline	Future (2023)	Future (2031)
Total vehicles entering cell-phone lot driveways (vehicles/day)[1]	646	706	748
VMT associated with circling around the airport loop (miles/day)	1,589	1,737	1,839

Distance around airport loop[2]:	1.23	miles
No. of loops by passenger vehicles during pick-up[3]:	2	

Scenario	Running Exhaust Emissions (lb/day)	
	ROG	NO_X
Baseline (2017)[4]	0.10	0.37
BAU Future (2023)[4]	0.04	0.17
Improved Future (2023)	0.00	0.00
Reduction (2023)	***0.04***	***0.17***
BAU Future (2031)[4]	0.02	0.09
Improved Future (2031)	0.00	0.00
Reduction (2031)	***0.02***	***0.09***

Notes:

[1] Baseline average daily trips for cell-phone lot obtained from JWA data for August 2018. Average daily trips for Future (2023) and Future (2031) scaled based on MAP.

[2] Distance around Airport loop obtained from Google Earth.

[3] It is assumed that passenger cars navigate two loops around the Airport when not using cell-phone lot.

[4] Baseline and BAU Future emissions are emissions that would have occurred if vehicles circled around the Airport loop and *did not* use the cell-phone lot. They are essentially avoided emissions.

Abbreviations:

BAU - business-as-usual
lb - pound
NO_X - oxides of Nitrogen
ROG - reactive organic gases

Table 4-19. Emissions from TNC Vehicles
John Wayne Airport AQIP
Santa Ana, California

Scenario	Average Daily TNC Trips		
	Baseline	**Future (2023)**	**Future (2031)**
Total TNC vehicles entering the airport (vehicles/day)[1]	1,248	1,364	1,445
VMT associated with circling around the airport loop (miles/day)	3,070	3,354	3,553

Distance around airport loop[2]:	1.23	miles
No. of loops by TNC vehicles between drop-off and pick-up[3]:	2	

Scenario	Running Exhaust Emissions (lb/day)	
	ROG	**NO_X**
Baseline (2017)	0.19	0.72
BAU Future (2023)	0.08	0.33
Improved Future (2023)[4]	0.00	0.00
Reduction (2023)	***0.08***	***0.33***
BAU Future (2031)	0.03	0.17
Improved Future (2031)[4]	0.00	0.00
Reduction (2031)	***0.03***	***0.17***

Notes:

[1] Baseline average daily trips for TNC vehicles obtained from JWA data for November 2018. Average daily trips for Future (2023) and Future (2031) scaled based on MAP.

[2] Distance around Airport loop obtained from Google Earth.

[3] It is assumed that TNC vehicles navigate two loops around the Airport in between drop-offs and pick-ups.

[4] BAU Future improvements assume that TNC vehicles are matched up with pick-ups such that they avoid circling the airport loop after a drop-off.

Abbreviations:

BAU - business-as-usual
lb - pound
NO_X - oxides of Nitrogen
ROG - reactive organic gases
TNC - Transportation Network Company

Table 4-20. Emission Factors for Light and Medium Duty Vehicles
John Wayne Airport AQIP
Santa Ana, California

Emission Factors for Light and Medium Duty Vehicles[1]						
Category	**Baseline (2017) EF**		**Future (2023) EF**		**Future (2031) EF**	
	ROG	**NO_x**	**ROG**	**NO_x**	**ROG**	**NO_x**
Running Exhaust (g/mile)	0.03	0.11	0.01	0.04	0.004	0.02
Idling, Rest Loss, Diurnal (g/vehicle/day)	0.76	0.00	0.54	0.00	0.38	0.00
Starting Exhaust, Hot Soak, Running Loss (g/trip)	0.93	0.33	0.62	0.20	0.41	0.13

Notes:

[1] Emission factors (for vehicle categories - LDA, LDT1, LDT2, and MDV) obtained from EMFAC2017 for CY 2017 for Baseline scenario, and CY 2023 and CY 2031 for Future scenarios.

Abbreviations:

CY - calendar year
EF - emission factor
g - grams
LDA - light duty vehicle
LTD1/LDT2 - light duty trucks
MDV - medium duty vehicle
NO_X - oxides of Nitrogen
ROG - reactive organic gases

Table 4-21. Emissions from Employee Commuting Policy (Bike-Share Program)
John Wayne Airport AQIP
Santa Ana, California

Scenario	Average Daily Employee Vehicle Trips		
	Baseline (2017)	**Future (2023)**	**Future (2031)**
Number of employees commuting to JWA via motor vehicle[1]	157	165	173
Daily employee vehicle trips[2]	314	330	346
Daily employee VMT (miles/day)[3]	4,107	4,312	4,528
Percent future growth[1]:		5%	
Employee trips/vehicle[2]:		2	
Employee mileage[3]:		13.08	miles/trip/day
IMPROVEMENT - Percentage of employee vehicle commute reduction using ***Bike-Share Program***[4]:		1%	

Scenario	Emissions (lb/day)	
	ROG	**NO_x**
Baseline (2017)	1.16	1.19
BAU Future (2023)	0.75	0.57
Improved Future (2023)	0.74	0.56
Reduction (2023)	***0.007***	***0.006***
BAU Future (2031)	0.50	0.32
Improved Future (2031)	0.50	0.32
Reduction (2031)	***0.005***	***0.003***

Notes:

[1] Baseline number of employees commuting to JWA obtained from CY 2018 JWA data. Number of employees commuting to JWA for Future (2023) and Future (2031) assumed to increase by 5 percent for each scenario year.

[2] Based on CalEEMod (construction worker trips), it is assumed that one round trip for employee equals two one-way trips.

[3] Vehicle miles travelled is obtained by using average trip length for terminal traffic from EIR 617.

[4] It is assumed that *Bike Share Program* will reduce employee VMT by 1 percent.

Abbreviations:
BAU - business-as-usual
CalEEMod - CALifornia Emissions Estimator MODel
lb - pound
NO_X - oxides of Nitrogen
ROG - reactive organic gases
VMT - vehicle miles travelled

Table 4-22. Emissions from Employee Commuting Policy (Ride-Share Program)
John Wayne Airport AQIP
Santa Ana, California

Scenario	Average Daily Employee Vehicle Trips		
	Baseline (2017)	Future (2023)	Future (2031)
Number of employees commuting to JWA via motor vehicle[1]	157	165	173
Daily employee vehicle trips[2]	314	330	346
Daily employee VMT (miles/day)[3]	4,107	4,312	4,528
Number of employees commuting to JWA via motor vehicle that participate in carpool[4]	7	7	8
Number of employee vehicles that participate in carpool[5]	2	2	2
Reduction in number of employee vehicles due to carpool	5	5	6
Reduction in daily employee vehicle trips due to carpool[2]	10	10	12
Reduction in daily employee VMT due to carpool (miles/day)[5]	131	131	157

Percent future growth[1]:	5%	
Employee trips/vehicle[2]:	2	
Employee mileage[3]:	13.08	miles/trip/day
Percent of employees participating in carpool[4]:	4.5%	

Scenario	Emissions (lb/day)	
	ROG	NO_x
Baseline (2017)	1.16	1.19
BAU Future (2023)	0.75	0.57
Improved Future (2023)	0.72	0.55
Reduction (2023)	***0.023***	***0.017***
BAU Future (2031)	0.50	0.32
Improved Future (2031)	0.48	0.31
Reduction (2031)	***0.017***	***0.011***

Notes:

[1] Baseline number of employees commuting to JWA obtained from CY 2018 JWA data. Number of employees commuting to JWA for Future (2023) and Future (2031) assumed to increase by 5 percent for each scenario year.

[2] Based on CalEEMod (construction worker trips), it is assumed that one round trip for employee equals two one-way trips.

[3] Vehicle miles travelled is obtained by using average trip length for terminal traffic from EIR 617.

[4] Percent of employees participating in ride share program obtained from CY 2018 JWA data.

[5] Conservatively assumes that each carpooling vehicle participating can hold up to 5 employees.

Abbreviations:

BAU - business-as-usual
CalEEMod - CALifornia Emissions Estimator MODel
lb - pound
NO_X - oxides of Nitrogen
ROG - reactive organic gases
VMT - vehicle miles travelled

Table 4-23. Emissions Reduction Summary
John Wayne Airport AQIP
Santa Ana, California

Initiative/Measure	Scenario	ROG[1] (lb/day)	NO_X[1] (lb/day)
Measure 1: GSE	Baseline (2017)	19.94	122.06
	BAU Future (2023)	13.81	82.58
	Reduction (2023)	*3.22*	*26.32*
	BAU Future (2031)	9.00	54.66
	Reduction (2031)	*3.15*	*21.49*
Measure 2: Jet Fuel Delivery Trucks	Baseline (2017)	0.85	20.22
	BAU Future (2023)	0.10	9.35
	Reduction (2023)	*0.10*	*9.35*
	BAU Future (2031)	0.08	8.35
	Reduction (2031)	*0.08*	*8.35*
Measure 3: Concessions Nighttime Delivery Policy	Baseline (2017)	0.05	0.22
	BAU Future (2023)	0.05	0.20
	Reduction (2023)	*0.03*	*0.13*
	BAU Future (2031)	0.04	0.17
	Reduction (2031)	*0.02*	*0.11*
Measure 4: JWA Owned Vehicle Clean Fleet Policy - On-Road Vehicles	Baseline (2017)	0.57	1.57
	BAU Future (2023)	0.34	1.16
	Reduction (2023)	*0.01*	*0.01*
	BAU Future (2031)	0.22	0.97
	Reduction (2031)	*0.08*	*0.04*
Measure 4: JWA Owned Vehicle Clean Fleet Policy - Off-Road Vehicles	Baseline (2017)	0.08	0.70
	BAU Future (2023)	0.03	0.31
	Reduction (2023)	*0.00*	*0.00*
	BAU Future (2031)	0.02	0.18
	Reduction (2031)	*0.00*	*0.00*
Measure 5: Parking Shuttle Bus Electrification	Baseline (2017)	0.31	1.65
	BAU Future (2023)	0.34	1.79
	Reduction (2023)	*0.17*	*0.90*
	BAU Future (2031)	0.36	1.90
	Reduction (2031)	*0.30*	*1.58*
Measure 6: Clean Construction Program	Emissions Reductions Not Quantified		
Measure 7: Smart Parking Features	Baseline (2017)	0.71	1.25
	BAU Future (2023)	0.59	0.98
	Reduction (2023)	*0.30*	*0.49*
	BAU Future (2031)	0.53	0.87
	Reduction (2031)	*0.26*	*0.43*

Table 4-23. Emissions Reduction Summary
John Wayne Airport AQIP
Santa Ana, California

Initiative/Measure	Scenario	ROG[1] (lb/day)	NO_X[1] (lb/day)
Measure 8: Congestion and Passenger Vehicle Reduction	Baseline (2017)	0.10	0.37
	BAU Future (2023)	0.04	0.17
	Reduction (2023)	*0.04*	*0.17*
	BAU Future (2031)	0.02	0.09
	Reduction (2031)	*0.02*	*0.09*
Measure 9: TNC Vehicle Miles Traveled Reduction Policy	Baseline (2017)	0.19	0.72
	BAU Future (2023)	0.08	0.33
	Reduction (2023)	*0.08*	*0.33*
	BAU Future (2031)	0.03	0.17
	Reduction (2031)	*0.03*	*0.17*
Intitiative 1: Taxi Clean Fleet Policy	Emissions Reductions Not Quantified		
Initiative 2: Electric Vehicle Charging Infrastructure	Emissions Reductions Not Quantified		
Initiative 3: Passenger Transportation Mode Shift	Emissions Reductions Not Quantified		
Initiative 4a: Orange County Employee Rideshare Program - Bike-Share Program	Baseline (2017)	1.16	1.19
	BAU Future (2023)	0.75	0.57
	Reduction (2023)	*0.01*	*0.01*
	BAU Future (2031)	0.50	0.32
	Reduction (2031)	*0.01*	*0.00*
Initiative 4b: Orange County Employee Rideshare Program - County Ride-Share Program	Baseline (2017)	1.16	1.19
	BAU Future (2023)	0.75	0.57
	Reduction (2023)	*0.02*	*0.02*
	BAU Future (2031)	0.50	0.32
	Reduction (2031)	*0.02*	*0.01*
Summary	Baseline (2017)	23.96	149.94
	BAU Future (2023)	16.13	97.43
	Reduction (2023)	***3.97***	***37.72***
	BAU Future (2031)	10.80	67.68
	Reduction (2031)	***3.97***	***32.29***

Notes:
[1] Emissions summerized from previous tables for individual initiatives or measures.

Abbreviations:
BAU - business-as-usual
GSE - ground support equipment
JWA - John Wayne Airport
lb - pound
NO_X - oxides of Nitrogen
ROG - reactive organic gases
TNC - Transportation Network Company

FIGURES

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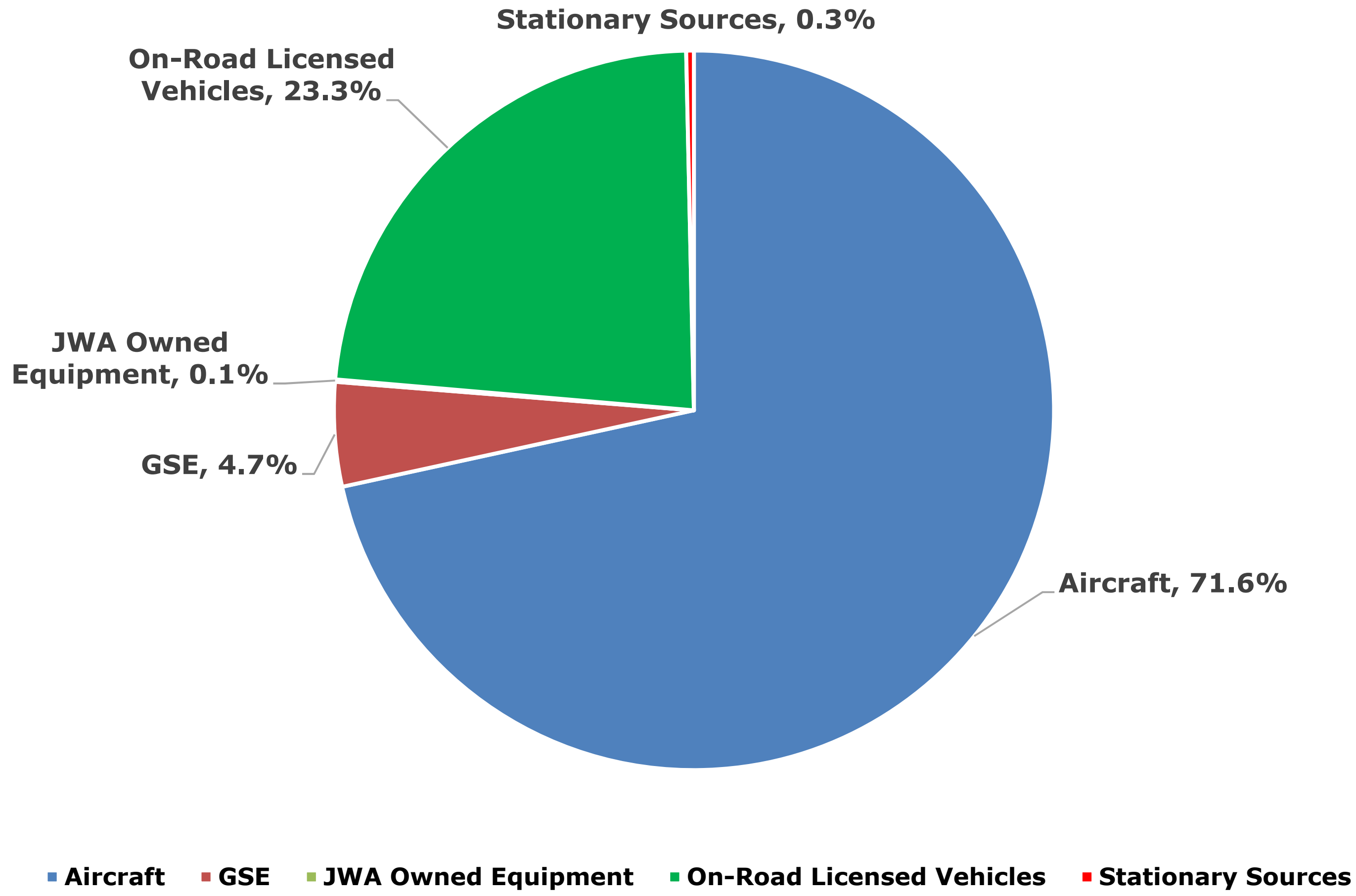

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Summary of NO_X Emissions Related to JWA Operations

Figure 1

PROJECT: 1690010169