

May 29, 2026

Ms. Melissa Gamoning
Program Supervisor
Planning, Rule Development & Implementation
South Coast Air Quality Management District
21865 Copley Drive
Diamond Bar, CA 91765-4178

CITY OF LONG BEACH, SOUTH COAST AIR QUALITY MANAGEMENT DISTRICT, MEMORANDUM OF UNDERSTANDING – ANNUAL PROGRESS REPORT FOR CALENDAR YEAR 2025

Dear Ms. Gamoning,

Long Beach Airport (“LGB” or “the Airport”) is pleased to submit the attached report detailing the progress achieved through calendar year (CY) 2025 related to the Airport’s commitments under the Facility-Based Mobile Source Measure for Commercial Airports Memorandum of Understanding (MOU) with the South Coast Air Quality Management District (South Coast AQMD).

On December 6, 2019, an MOU was executed between the South Coast AQMD and the Airport for the voluntary reduction of emissions from commercial non-aircraft airport mobile sources. This report details the progress achieved in CY 2025 and provides an overview of the Airport’s efforts to implement the MOU measures and quantify actual emission reductions. There is one measure in the LGB MOU related to non-aircraft commercial passenger airport mobile sources – the Ground Support Equipment (GSE) Program. Required MOU documentation for this measure and emission estimates are provided in the following sections. This report does not apply to any source or operation of any source that is not specifically identified in the MOU measure.

PROGRESS ON MOU MEASURES

MOU SCHEDULE NO. 1 – GROUND SUPPORT EQUIPMENT

Schedule No. 1 of the MOU requires the Airport to reduce oxides of nitrogen (NOx) emissions from GSE to achieve a GSE fleet composite horsepower-weighted emissions factor (performance level) that is less than or equal to 0.93 grams of NOx per brake horsepower-hour (g/hp-hr) by January 1, 2023 and is less than or equal to 0.44 g/hp-hr NOx by January 1, 2031. To achieve these targets, the Airport has coordinated with airlines and third-party GSE operators to facilitate an accelerated turnover of existing equipment to low or zero emission equipment.

A list of GSE subject to this measure with the required information specified in MOU Schedule No. 1 Section III.B.1., *List of Commercial Ground Support Equipment*, is provided in **Exhibit A, Table 1**. Information on the sale or retirement of non-zero emission GSE subject to this measure including information submitted to the California Air Resources Board DOORS database and relocation details (as applicable) as required by MOU Schedule No. 1, Section III.B.2, *List of Sold, Retired, or Relocated Equipment*, is presented in **Exhibit A, Table 2**. Furthermore, as required by MOU Schedule No. 1, Section

III.B.3, *Emission Inventory*, an inventory of GSE emissions associated with commercial operations at the Airport has been developed and is included in this report as **Exhibit B**.

RESULTS OF THE 2025 GSE SURVEY

Overall, 39 pieces of reportable GSE were identified as having been added to or removed from service at Long Beach Airport in CY 2025. Including all commercial equipment that operated in a regular-use capacity on the Airfield at any point in CY 2025, there were 184 pieces of ≥ 25 horsepower equipment (collectively, “reportable GSE”) in the composite fleet—a net increase of 2 pieces of equipment relative to CY 2024. The composite fleet saw no net change in reportable pre-Tier 4 final diesel GSE and a net reduction of 2 pieces of pre-model year 2010 non-diesel equipment (collectively, “legacy GSE”). There were 110 pieces of reportable electric ground support equipment (eGSE), representing a net increase of 2 pieces of equipment; 35 diesel-powered GSE, representing no net change; 33 gasoline-powered GSE, representing a net decrease of 1 piece of equipment; and 6 liquefied petroleum gas- or propane-powered GSE, representing a net increase of 1 piece of equipment, each relative to CY 2024. The table below presents the current aggregate GSE fleet breakdown by fuel and annual emissions.

2025 Long Beach Airport MOU Commercial GSE Summary

Fleet Mix ¹					Fleet Emissions (tons per year; metric tons for CO ₂ e) ²						
Total	Electric	Diesel	Gasoline	Other	CO	ROG	NOx	PM ₁₀	PM _{2.5}	SOx	CO ₂ e
184	110	35	33	6	14.1	0.7	2.5	0.12	0.10	<0.01	1,457

Notes:

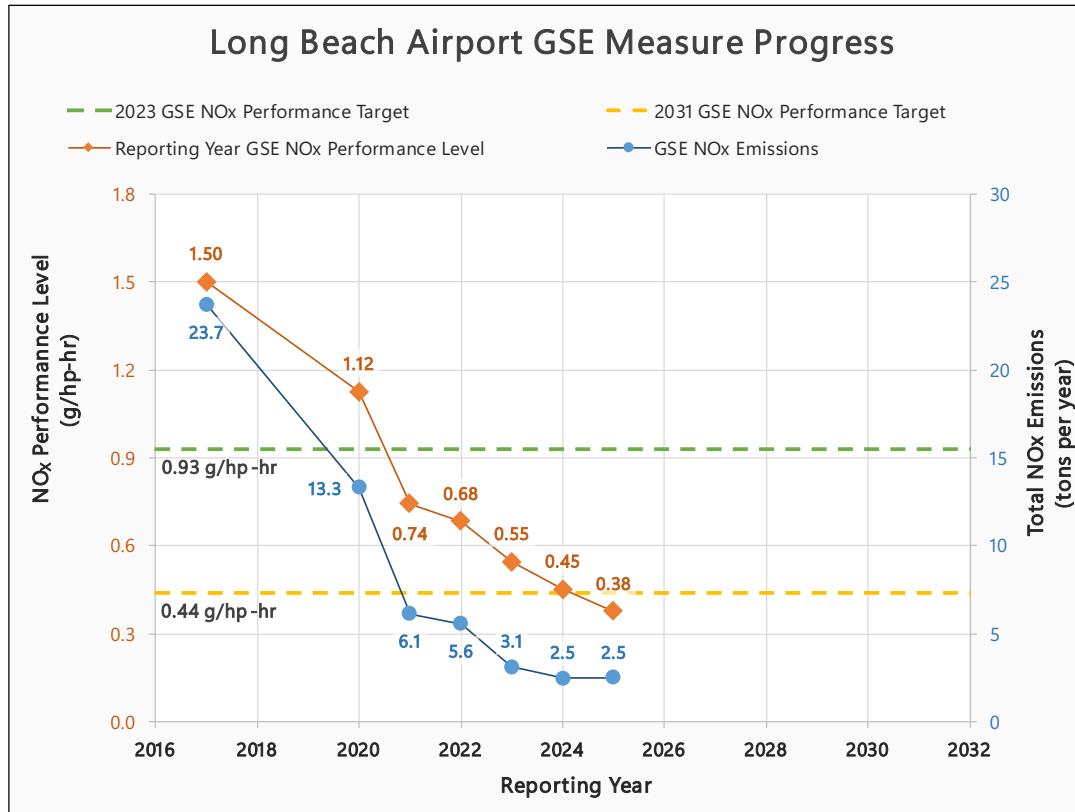
1. Fleet counts include ≥ 25 horsepower in-use equipment used in the calculation of the NOx performance factor.
2. Fleet emissions include the operation of all reported equipment, including < 25 horsepower and low-use (< 200 hours per year) or emergency-use equipment.

In CY 2025, the Airport achieved a performance level of 0.38 g/hp-hr of NOx, demonstrating an accelerated achievement of the MOU’s January 1, 2031, target.

The CY 2025 performance level reflects a meaningful decrease relative to the CY 2024 level of 0.45 g/hp-hr NOx. The Airport anticipates the performance level will continue to decrease as it builds upon its industry partnerships to facilitate the accelerated replacement or relocation of the highest-emitting GSE.

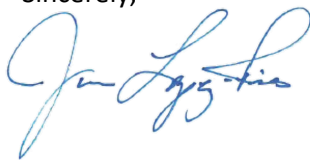
For CY 2025, annual NOx emissions from commercial GSE totaled 2.5 tons, unchanged from the 2024 annual NOx emissions from GSE. The lack of reduction in NOx emissions can be attributed to changing equipment usage patterns for equipment remaining in operation at LGB as old equipment is retired and new equipment brought into service. The Airport’s GSE Emissions Reduction Program has achieved an annual reduction of 89.5 percent relative to the annual NOx emissions from GSE from 2017, the baseline year of the Program. The following figure illustrates the estimated annual NOx emissions and performance level associated with the LGB GSE fleet over time.

Long Beach Airport MOU Commercial GSE Performance and Emissions by Survey Year



Long Beach Airport truly appreciates the ongoing partnership and collaboration with South Coast AQMD. If there are any questions, please contact either myself at juan.lopez-rios@longbeach.gov (562) 570-2608 or Jeremy Gilbride at gilbridej@cdmsmith.com (949) 930-9809 at your convenience.

Sincerely,



Juan López-Rios
Deputy Director, Long Beach Airport

Enclosures:

Exhibit A: MOU Schedule No. 1 – Ground Support Equipment MOU Report

Exhibit B: MOU Schedule No. 1 – Calendar Year 2025 Ground Support Equipment Survey Emissions Inventory Report, May 2026

Exhibit A

MOU Schedule No. 1 – Ground Support Equipment MOU Report

MOU SCHEDULE NO. 1 – GROUND SUPPORT EQUIPMENT

This MOU Schedule No. 1 is based on the City's AQIP measure for ground support equipment¹.

- I. PROGRAM DESCRIPTION – Require that all ground support equipment associated with commercial operations achieve a fleet average NOx emission factors of 0.93 and 0.44 g/bhp-hr by January 1, 2023 and January 1, 2031, respectively.
- II. PROGRAM TIMEFRAME – Upon execution through 2032.
- III. AIRPORT OBLIGATIONS – The City agrees to:
 - A. Implement the measure by working with airport tenants to achieve the above performance targets by specified dates through accelerated turnover to cleaner equipment. Airport shall have complete discretion as to mechanisms used to implement this measure. Such mechanisms may include leases, licenses, operational requirements, or other agreements.
 - B. Beginning in 2021, and every year thereafter through 2032, provide the following information to South Coast AQMD on an annual basis by June 1 for each preceding calendar year:
 1. List of ground support equipment subject to this GSE measure with the following information:
 - a. Equipment ID
 - b. Equipment type
 - c. Fuel type
 - d. Engine model year
 - e. Power rating (hp or kW)
 - f. Engine tier level (for diesel engines)
 - g. Annual activity data for non-zero emission equipment that is sufficient to determine emission reductions at a reasonable level of accuracy (i.e., actual operating hours from hour meter readings/maintenance records, average operating hours representative of equipment type and airport, or average operating hours by equipment/fuel type from CARB's OFFROAD model, if applicable)

¹ 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.

2. For non-zero emission ground support equipment subject to this GSE measure, information regarding the sale or retirement of equipment available through CARB's DOORS system and, for pre-Tier 4 diesel, pre-2010 gasoline, or pre-2010 LPG ground support equipment relocated from LGB to another airport within the South Coast Air Basin, identify: a) the airport to which equipment is relocated, b) date of relocation, and c) estimated projected usage hours.
3. An annual emission inventory for all ground support equipment associated with commercial operations at LGB, including methodology and calculations.

III SOUTH COAST AQMD OBLIGATIONS – South Coast AQMD agrees to:

- A. Verify emission reductions from the implementation of this AQIP measure in order to determine actual emission reductions.
- B. Ensure that any emission reduction data related to this AQIP measure and other pertinent information and accessible to the public and the USEPA.

MOU SCHEDULE NO. 1 – III.B.1. List of Commercial Ground Support Equipment

List of ground support equipment subject to this GSE measure with the following information: a) Equipment ID, b) Equipment type, c) Fuel type, d) Engine model year, e) Power rating (hp or kW), f) Engine tier level (for diesel engines), g) Annual activity data based on average operating hours from CARB's OFFROAD model

Airport GSE ID	Equipment Type	Fuel Type	Engine Model Year	Power Rating (hp)	Engine Tier Level	Activity (hours/year)	Vehicle Description	Vehicle Manufacture	Designated Low Use	On-Road Equivalent Engine
LGB-OP03-001	Forklift	LPG	1993	93	--	730	--	Toyota	In-Use	Off-Road
LGB-OP03-002	Forklift	LPG	1996	94	--	730	--	Toyota	In-Use	Off-Road
LGB-OP07-002	Fuel Truck	Diesel	1981	275	Tier 0	0	Jet Fuel Truck - 10,000 gallon	Dart	In-Use	Off-Road
LGB-OP07-005	A/C Tug Narrow Body	Diesel	2011	75	Tier 3	730	Small Toyota Tug	Toyota Industrial Equipment	In-Use	Off-Road
LGB-OP07-006	Lift	Electric	2000	98	--	96	Scissor Lift	Upright	In-Use	Off-Road
LGB-OP07-007	Forklift	Gasoline	2012	53	--	20	Toyota Forklift	Toyota	In-Use	Off-Road
LGB-OP07-008	Cart	Electric	2002	3	--	0	People Mover	Club Cart	In-Use	Off-Road
LGB-OP07-009	A/C Tug Narrow Body	Electric	2006	33	--	20	Stand up Lektro	Lektro-8750	In-Use	Off-Road
LGB-OP07-010	A/C Tug Narrow Body	Electric	2000	45	--	2,920	Sit Down Lektro	Lektro-8850	In-Use	Off-Road
LGB-OP07-011	Sweeper	Electric	2013	3	--	56	Scrubber	Factory Cat Clark	In-Use	Off-Road
LGB-OP07-012	Sweeper	Gasoline	2004	49	--	60	Sweeper	American Lincoln	Low-Use	Off-Road
LGB-OP07-013	Sweeper	Electric	1998	51	--	0	Sweeper/Scrubber	American Lincoln	In-Use	Off-Road
LGB-OP07-014	Cart	Electric	2004	4	--	2,190	Electric Flat Bed	Club Car	In-Use	Off-Road
LGB-OP07-015	Cart	Electric	2015	12	--	0	Golf Cart	Club Cart	In-Use	Off-Road
LGB-OP07-016	Lav Cart	Electric	2009	12	--	24	Lav Cart	Aero Specialties	In-Use	Off-Road
LGB-OP07-017	Cart	Electric	2002	12	--	192	Water Cart	Aero Specialties	In-Use	Off-Road
LGB-OP07-018	Fuel Truck	Diesel	2020	200	Tier 4	2,190	Jet Fuel Truck - 3,000 gallons	International	In-Use	Off-Road
LGB-OP07-019	Fuel Truck	Diesel	2011	220	Tier 4i	800	Jet Fuel Truck - 7,000 gallons	International	In-Use	Off-Road

Airport GSE ID	Equipment Type	Fuel Type	Engine Model Year	Power Rating (hp)	Engine Tier Level	Activity (hours/year)	Vehicle Description	Vehicle Manufacture	Designated Low Use	On-Road Equivalent Engine
LGB-OP07-020	Fuel Truck	Diesel	2011	220	Tier 4i	800	Jet Fuel Truck - International 7,000 gallons		In-Use	Off-Road
LGB-OP07-023	Lav Cart	Electric	2008	12	--	0	Diesel Cart - 300 gallons	--	In-Use	Off-Road
LGB-OP07-024	Ground Power Unit	Diesel	2018	80	Tier 4	83	TLD GPU-406-T-cup-28	Areo Specialties	In-Use	Off-Road
LGB-OP07-025	Ground Power Unit	Diesel	2019	74	Tier 4	796	185,842 GPU	JetGo 900 GPU	In-Use	Off-Road
LGB-OP07-026	Fuel Truck	Gasoline	2020	297	--	2,555	AvGas fuel Truck - 1,000 gallons	Isuzu	In-Use	Off-Road
LGB-OP07-027	Fuel Truck	Gasoline	2020	297	--	2,555	AvGas fuel Truck - 1,000 gallons	Isuzu	In-Use	Off-Road
LGB-OP07-028	A/C Tug Narrow Body	Electric	2019	58	--	1,095	Sit Down Lektro	Lektro-8900	In-Use	Off-Road
LGB-OP07-029	Cart	Electric	2023	12	--	192	Water Cart	Areo Specialties	In-Use	Off-Road
LGB-OP07-030	Lav Cart	Electric	2023	12	--	48	Lav Cart	Areo Specialties	In-Use	Off-Road
LGB-OP07-031	Ground Power Unit	Diesel	2024	74	Tier 4	97	Jet 900	Areo Specialties	In-Use	Off-Road
LGB-OP08-003	A/C Tug Narrow Body	Diesel	2014	49	Tier 4	2,908	TUG	Tug	In-Use	Off-Road
LGB-OP08-005	Fuel Truck	Diesel	2017	250	Tier 4	83	REFUELER	EAM	In-Use	Off-Road
LGB-OP08-006	Fuel Truck	Gasoline	1995	300	--	41	REFUELER	GM	In-Use	Off-Road
LGB-OP08-007	Baggage Tug	Electric	2005	96	--	36	TUG	Lektro, Inc.	In-Use	Off-Road
LGB-OP08-008	Baggage Tug	Electric	1999	96	--	174	TUG	Lektro, Inc.	In-Use	Off-Road
LGB-OP08-010	Service Truck	Gasoline	2000	119	--	1	SERVICE TRUCK	Ford	In-Use	On-Road
LGB-OP08-013	Fuel Truck	Diesel	2019	260	--	185	REFUELER - HV607 SBA	INTERNATION AL	In-Use	On-Road
LGB-OP08-015	Ground Power Unit	Diesel	2013	130	Tier 4i	332	GPU-4060-T-CUP-28	TLD	In-Use	Off-Road
LGB-OP08-019	Fuel Truck	Diesel	2021	210	--	148	Avgas Truck - NPR7SN	ISUZU	In-Use	On-Road
LGB-OP08-021	Fuel Truck	Diesel	2014	215	--	83	Refueler - 7300 SFA	INTERNATION AL	In-Use	On-Road
LGB-OP08-022	Fuel Truck	Diesel	2022	260	--	142	Refueler Jet - MDL-7MA-300A-MRER-CNDAS	Garsite	In-Use	On-Road
LGB-OP08-023	Fuel Truck	Diesel	2000	235	--	3	Ford	F-350	In-Use	On-Road

Airport GSE ID	Equipment Type	Fuel Type	Engine Model Year	Power Rating (hp)	Engine Tier Level	Activity (hours/year)	Vehicle Description	Vehicle Manufacture	Designated Low Use	On-Road Equivalent Engine
LGB-OP08-024	Cart	Electric	2010	12	--	152	E-Z-GO	RXV	In-Use	Off-Road
LGB-OP08-025	Fuel Truck	Diesel	2022	210	--	123	ISUZU	NPR-HD	In-Use	On-Road
LGB-OP08-026	Fuel Truck	Diesel	2023	250	Tier 4	3,241	Skymark	RF10RD-2-2C-T4-XF	In-Use	Off-Road
LGB-OP08-027	Cart	Electric	2023	12	--	152	Clubcar	Villager 6	In-Use	Off-Road
LGB-OP08-028	Service Truck	Gasoline	2022	310	--	339	Chevrolet	Silverado 1500	In-Use	On-Road
LGB-OP08-029	Sweeper	Electric	2012	51	--	156	Tennant	T7	In-Use	Off-Road
LGB-OP08-030	Service Truck	Gasoline	1994	160	--	0	Ford	Ranger	In-Use	On-Road
LGB-OP08-031	Service Truck	Gasoline	2020	300	--	229	Ford	Explorer	In-Use	On-Road
LGB-OP08-032	Ground Power Unit	Electric	2023	150	--	113	ITW	Jetex Mobile eGPU-3GWB-28/40I	In-Use	Off-Road
LGB-OP08-033	Ground Power Unit	Electric	2023	150	--	288	ITW	Jetex Mobile eGPU-3GWB-28/40I	In-Use	Off-Road
LGB-OP08-034	Fuel Truck	Diesel	2014	215	--	22	7300 SBA	INTERNATION AL	In-Use	On-Road
LGB-OP08-035	A/C Tug Narrow Body	Electric	2007	132	--	92	Lektro, Inc.	AP-8850SD	In-Use	Off-Road
LGB-OP08-036	Fuel Truck	Gasoline	2022	350	--	183	Ramp Service	Isuzu	In-Use	On-Road
LGB-OP12-001	A/C Tug Narrow Body	Gasoline	1982	95	--	10	--	HARLAN	Low-Use	Off-Road
LGB-OP12-002	Forklift	LPG	1998	50	--	591	GC30K	CAT	In-Use	Off-Road
LGB-OP12-003	Baggage Tug	Electric	2008	5	--	846	AP8600	Lektro	In-Use	Off-Road
LGB-OP13-001	Baggage Tug	Electric	2001	40	--	211	--	Tug	In-Use	Off-Road
LGB-OP13-002	Baggage Tug	Electric	2001	40	--	125	--	Tug	In-Use	Off-Road
LGB-OP13-003	Baggage Tug	Electric	2002	40	--	125	--	Tug	In-Use	Off-Road
LGB-OP13-005	Baggage Tug	Electric	2002	40	--	125	--	Tug	In-Use	Off-Road
LGB-OP13-006	Baggage Tug	Electric	2005	40	--	211	--	Tug	In-Use	Off-Road
LGB-OP13-007	Baggage Tug	Gasoline	2016	40	--	345	--	Tug	In-Use	Off-Road
LGB-OP13-008	Belt Loader	Electric	2013	60	--	706	--	Tug	In-Use	Off-Road
LGB-OP13-009	Belt Loader	Electric	2013	60	--	706	--	Tug	In-Use	Off-Road
LGB-OP13-010	Belt Loader	Electric	2017	60	--	706	--	Tug	In-Use	Off-Road
LGB-OP13-011	Belt Loader	Electric	2017	60	--	706	--	Tug	In-Use	Off-Road
LGB-OP13-012	Belt Loader	Electric	2018	60	--	706	--	Tug	In-Use	Off-Road
LGB-OP13-013	Belt Loader	Electric	2018	60	--	706	--	Tug	In-Use	Off-Road
LGB-OP13-014	Belt Loader	Electric	2019	60	--	706	--	Tug	In-Use	Off-Road
LGB-OP13-015	Belt Loader	Electric	2019	60	--	706	--	Tug	In-Use	Off-Road
LGB-OP13-016	Forklift	LPG	2007	52	--	591	--	Toyota	In-Use	Off-Road
LGB-OP13-017	Lav Truck	Gasoline	2018	297	--	1,158	--	Phoenix Metals	In-Use	On-Road
LGB-OP13-018	Passenger Stand	Gasoline	2018	49	--	137	--	Phoenix Metals	In-Use	Off-Road
LGB-OP13-019	Passenger Stand	Gasoline	2018	49	--	137	--	Wollard	In-Use	Off-Road

Airport GSE ID	Equipment Type	Fuel Type	Engine Model Year	Power Rating (hp)	Engine Tier Level	Activity (hours/year)	Vehicle Description	Vehicle Manufacture	Designated Low Use	On-Road Equivalent Engine
LGB-OP13-021	Catering Truck	Gasoline	2019	200	--	928	--	Mallaghan	In-Use	On-Road
LGB-OP13-024	Air Start Unit	Diesel	2018	333	Tier 4	79	--	182,491	In-Use	Off-Road
LGB-OP13-025	Ground Power Unit	Electric	2021	155	--	798	--	--	In-Use	Off-Road
LGB-OP13-026	Ground Power Unit	Electric	2021	155	--	798	--	--	In-Use	Off-Road
LGB-OP13-027	Ground Power Unit	Electric	2016	155	--	798	--	--	In-Use	Off-Road
LGB-OP13-028	Ground Power Unit	Electric	2018	155	--	798	--	--	In-Use	Off-Road
LGB-OP13-029	Air Conditioner	Electric	2018	131	--	391	--	--	In-Use	Off-Road
LGB-OP13-030	Air Conditioner	Electric	2011	131	--	391	--	--	In-Use	Off-Road
LGB-OP13-031	Air Conditioner	Electric	2011	131	--	391	--	--	In-Use	Off-Road
LGB-OP13-032	Baggage Tug	Electric	2002	40	--	125	--	TUG	In-Use	Off-Road
LGB-OP13-034	Baggage Tug	Electric	2001	40	--	125	--	TUG	In-Use	Off-Road
LGB-OP13-035	Baggage Tug	Electric	2001	40	--	211	--	TUG	In-Use	Off-Road
LGB-OP13-036	Baggage Tug	Electric	2001	40	--	211	--	TUG	In-Use	Off-Road
LGB-OP13-037	Baggage Tug	Electric	2002	40	--	125	--	TUG	In-Use	Off-Road
LGB-OP13-038	Belt Loader	Electric	2017	60	--	706	--	TUG	In-Use	Off-Road
LGB-OP13-039	A/C Tug Narrow Body	Electric	1983	74	--	385	--	GT24	In-Use	Off-Road
LGB-OP13-041	A/C Tug Narrow Body	Electric	1983	74	--	385	--	GT24	In-Use	Off-Road
LGB-OP13-044	Belt Loader	Electric	2011	60	--	706	660E	TUG	In-Use	Off-Road
LGB-OP13-045	Belt Loader	Electric	2017	60	--	706	660E	TUG	In-Use	Off-Road
LGB-OP13-046	Passenger Stand	Gasoline	2017	40	--	137	CMPPS87/137	Phoenix Metals	In-Use	Off-Road
LGB-OP13-047	Passenger Stand	Gasoline	2018	40	--	137	CMPPS87/137	Phoenix Metals	In-Use	Off-Road
LGB-OP13-048	Passenger Stand	Gasoline	2018	40	--	137	CMPPS87/137	Phoenix Metals	In-Use	Off-Road
LGB-OP13-049	Ground Power Unit	Electric	2019	155	--	798	2400 Mobile	ITW GSE	In-Use	Off-Road
LGB-OP13-050	Ground Power Unit	Electric	2022	155	--	798	2400 Mobile	ITW GSE	In-Use	Off-Road
LGB-OP13-051	Ground Power Unit	Electric	2022	155	--	798	2400 Mobile	ITW GSE	In-Use	Off-Road
LGB-OP13-052	Air Conditioner	Electric	2001	131	--	391	ACE-H-302-EMP	TLD	In-Use	Off-Road
LGB-OP13-053	Air Conditioner	Electric	2011	131	--	391	ACE-H-302-EMP	TLD	In-Use	Off-Road
LGB-OP13-054	Air Conditioner	Electric	2011	131	--	391	ACE-H-302-EMP	TLD	In-Use	Off-Road
LGB-OP13-055	Air Conditioner	Electric	2011	131	--	391	ACE-H-302-EMP	TLD	In-Use	Off-Road
LGB-OP13-056	A/C Tug Narrow Body	Diesel	2014	100	Tier 4	385	GT35	TUG	In-Use	Off-Road
LGB-OP13-057	Passenger Stand	Gasoline	2018	84	--	137	CMPS170	Wollard	In-Use	Off-Road
LGB-OP13-058	Passenger Stand	Gasoline	2018	84	--	137	CMPS170	Wollard	In-Use	Off-Road
LGB-OP13-059	Belt Loader	Electric	2023	60	--	706	660E	Tug	In-Use	Off-Road
LGB-OP13-060	Belt Loader	Electric	2023	60	--	706	660E	Tug	In-Use	Off-Road
LGB-OP13-061	Baggage Tug	Electric	2023	40	--	846	T-137 V3	Charlatte	In-Use	Off-Road
LGB-OP13-062	Baggage Tug	Electric	2023	40	--	846	T-137 V3	Charlatte	In-Use	Off-Road

Airport GSE ID	Equipment Type	Fuel Type	Engine Model Year	Power Rating (hp)	Engine Tier Level	Activity (hours/year)	Vehicle Description	Vehicle Manufacture	Designated Low Use	On-Road Equivalent Engine
LGB-OP13-063	Baggage Tug	Electric	2023	40	--	846	T-137 V3	Charlatte	In-Use	Off-Road
LGB-OP13-064	Baggage Tug	Electric	2023	40	--	846	T-137 V3	Charlatte	In-Use	Off-Road
LGB-OP13-065	Baggage Tug	Electric	2023	40	--	846	T-137 V3	Charlatte	In-Use	Off-Road
LGB-OP13-066	A/C Tug Narrow Body	Electric	2023	75	--	385	TMX 150 12E	TLD	In-Use	Off-Road
LGB-OP13-067	A/C Tug Narrow Body	Electric	2023	75	--	385	TMX 150 12E	TLD	In-Use	Off-Road
LGB-OP13-068	A/C Tug Narrow Body	Electric	2023	75	--	385	TMX 150 12E	TLD	In-Use	Off-Road
LGB-OP13-069	A/C Tug Narrow Body	Electric	2023	75	--	385	TMX 150 12E	TLD	In-Use	Off-Road
LGB-OP13-070	A/C Tug Narrow Body	Electric	2023	75	--	385	TMX 150 12E	TLD	In-Use	Off-Road
LGB-OP13-071	A/C Tug Narrow Body	Electric	2023	75	--	385	TMX 150 12E	TLD	In-Use	Off-Road
LGB-OP13-072	Passenger Stand	Gasoline	2024	25	--	137	CMPPS87/137	Phoenix Metals	In-Use	Off-Road
LGB-OP13-073	Baggage Tug	Electric	2024	40	--	846	T137 PRO	Charlatte	In-Use	Off-Road
LGB-OP13-074	Baggage Tug	Electric	2024	40	--	846	T137 PRO	Charlatte	In-Use	Off-Road
LGB-OP13-075	Baggage Tug	Electric	2024	40	--	846	T137 PRO	Charlatte	In-Use	Off-Road
LGB-OP13-076	Baggage Tug	Electric	2024	40	--	846	T137 PRO	Charlatte	In-Use	Off-Road
LGB-OP13-077	Baggage Tug	Electric	2024	40	--	846	T137 PRO	Charlatte	In-Use	Off-Road
LGB-OP13-078	Baggage Tug	Electric	2024	40	--	846	T137 PRO	Charlatte	In-Use	Off-Road
LGB-OP13-079	Baggage Tug	Electric	2024	40	--	846	T137 PRO	Charlatte	In-Use	Off-Road
LGB-OP13-080	Baggage Tug	Electric	2024	40	--	846	T137 PRO	Charlatte	In-Use	Off-Road
LGB-OP13-081	Baggage Tug	Electric	2024	40	--	846	T137 PRO	Charlatte	In-Use	Off-Road
LGB-OP13-082	Baggage Tug	Electric	2024	40	--	846	T137 PRO	Charlatte	In-Use	Off-Road
LGB-OP13-083	Baggage Tug	Electric	2024	40	--	846	T137 PRO	Charlatte	In-Use	Off-Road
LGB-OP13-084	Baggage Tug	Electric	2024	40	--	846	T137 PRO	Charlatte	In-Use	Off-Road
LGB-OP13-085	Baggage Tug	Electric	2024	40	--	846	T137 PRO	Charlatte	In-Use	Off-Road
LGB-OP13-086	Baggage Tug	Electric	2024	40	--	846	T137 PRO	Charlatte	In-Use	Off-Road
LGB-OP13-087	Baggage Tug	Electric	2024	40	--	846	T137 PRO	Charlatte	In-Use	Off-Road
LGB-OP13-088	Baggage Tug	Electric	2024	40	--	846	T137 PRO	Charlatte	In-Use	Off-Road
LGB-OP13-089	Baggage Tug	Electric	2024	40	--	846	T137 PRO	Charlatte	In-Use	Off-Road
LGB-OP13-090	Baggage Tug	Electric	2024	40	--	846	T137 PRO	Charlatte	In-Use	Off-Road
LGB-OP13-091	Baggage Tug	Electric	2024	40	--	846	T137 PRO	Charlatte	In-Use	Off-Road
LGB-OP13-092	Passenger Stand	Gasoline	2025	84	--	60	CMPPS87/137	Phoenix Metals	In-Use	Off-Road
LGB-OP13-093	Ground Power Unit	Electric	2025	121	--	763	2400 Mobile	ITW GSE	In-Use	Off-Road
LGB-OP16-001	Forklift	LPG	2015	155	--	228	AFL05	Hyster H50FT	In-Use	Off-Road
LGB-OP16-004	Generator	Diesel	2017	24	Tier 4	468	APLD	GENERAC	In-Use	Off-Road
LGB-OP16-005	Generator	Diesel	2017	24	Tier 4	60	APLD	GENERAC	In-Use	Off-Road
LGB-OP16-006	Generator	Diesel	2018	24	Tier 4	108	APLD	GENERAC	In-Use	Off-Road
LGB-OP16-007	Generator	Diesel	2018	24	Tier 4	72	APLD	GENERAC	In-Use	Off-Road
LGB-OP16-009	Belt Loader	Electric	2000	85	--	0	ACME	TUG 660E	In-Use	Off-Road
LGB-OP16-011	Belt Loader	Electric	2000	85	--	0	ACME	TUG 660E	In-Use	Off-Road
LGB-OP16-019	Cargo Loader	Gasoline	2015	154	--	180	AL220	TLD	In-Use	Off-Road
LGB-OP16-020	Service Truck	Gasoline	2017	285	--	120	APK22	FORD F250	In-Use	On-Road

Airport GSE ID	Equipment Type	Fuel Type	Engine Model Year	Power Rating (hp)	Engine Tier Level	Activity (hours/year)	Vehicle Description	Vehicle Manufacture	Designated Low Use	On-Road Equivalent Engine
LGB-OP16-022	Ground Power Unit	Diesel	2010	155	Tier 3	396	AGPU	TLD GPU 4090-T-CUP	In-Use	Off-Road
LGB-OP16-023	Air Start Unit	Diesel	2019	513	Tier 4	24	AS270	ASU-600-270-CUP	In-Use	Off-Road
LGB-OP16-024	Cargo Loader	Diesel	2021	154	Tier 4	192	AL22D	TLD 929	In-Use	Off-Road
LGB-OP16-026	A/C Tug Narrow Body	Diesel	2022	175	Tier 4	120	ATA27	TLD- TMX350	In-Use	Off-Road
LGB-OP16-027	Baggage Tug	Electric	2023	85	--	96	ATGOE	TAYLOR DUN L40	In-Use	Off-Road
LGB-OP16-028	Baggage Tug	Electric	2023	85	--	180	ATGOE	TAYLOR DUN L40	In-Use	Off-Road
LGB-OP16-029	Baggage Tug	Electric	2023	85	--	84	ATGOE	TAYLOR DUN L40	In-Use	Off-Road
LGB-OP16-030	Baggage Tug	Electric	2023	85	--	108	ATGOE	TAYLOR DUN L40	In-Use	Off-Road
LGB-OP16-031	Ground Power Unit	Diesel	2018	154	Tier 4	492	AGPU	TLD GPU 4090-T-CUP	In-Use	Off-Road
LGB-OP16-032	Cargo Loader	Gasoline	2018	385	--	240	AL220	TLD 929	In-Use	Off-Road
LGB-OP16-033	Cargo Loader	Diesel	2019	154	Tier 4	228	AL22D	TLD 929	In-Use	Off-Road
LGB-OP16-034	Baggage Tug	Electric	2023	85	--	132	ATGOE	TAYLOR DUN L40	In-Use	Off-Road
LGB-OP16-035	Baggage Tug	Electric	2023	85	--	156	ATGOE	TAYLOR DUN L40	In-Use	Off-Road
LGB-OP16-036	Baggage Tug	Electric	2023	85	--	228	ATGOE	TAYLOR DUN L40	In-Use	Off-Road
LGB-OP18-001	Baggage Tug	Gasoline	2019	61	--	846	AV50PK25	Other	In-Use	Off-Road
LGB-OP18-002	Baggage Tug	Gasoline	2019	61	--	846	AV50PK25	Other	In-Use	Off-Road
LGB-OP18-003	Baggage Tug	Gasoline	2019	61	--	846	AV50PK25	Other	In-Use	Off-Road
LGB-OP18-004	Baggage Tug	Gasoline	2019	61	--	846	AV50PK25	Other	In-Use	Off-Road
LGB-OP18-005	Air Start Unit	Diesel	2014	435	Tier 4	79	TMD-180	TUG TECH	In-Use	Off-Road
LGB-OP18-006	Belt Loader	Gasoline	2019	64	--	511	663-28	TUG TECHNOLOGIES, INC.	In-Use	Off-Road
LGB-OP18-007	Belt Loader	Gasoline	2019	64	--	706	663-28	TUG TECHNOLOGIES, INC.	In-Use	Off-Road
LGB-OP18-009	A/C Tug Narrow Body	Diesel	2019	75	Tier 4	154	GT35	TUG TECHNOLOGIES, INC.	In-Use	Off-Road
LGB-OP18-010	A/C Tug Narrow Body	Diesel	2019	84	Tier 4	275	Eagle TTR-12	OTHER	In-Use	Off-Road
LGB-OP18-011	Belt Loader	Diesel	2014	49	Tier 4	282	TC-88	Other	In-Use	Off-Road
LGB-OP18-012	Air Conditioner	Diesel	2015	130	Tier 4	391	ACU 302-H-CUP	TLD	In-Use	Off-Road
LGB-OP18-016	Baggage Tug	Electric	2025	40	--	211	T137-V3	Charlatte	In-Use	Off-Road

Airport GSE ID	Equipment Type	Fuel Type	Engine Model Year	Power Rating (hp)	Engine Tier Level	Activity (hours/year)	Vehicle Description	Vehicle Manufacture	Designated Low Use	On-Road Equivalent Engine
LGB-OP18-017	Baggage Tug	Electric	2025	40	--	211	T137-V3	Charlatte	In-Use	Off-Road
LGB-OP18-018	Baggage Tug	Electric	2025	40	--	211	T137-V3	Charlatte	In-Use	Off-Road
LGB-OP18-019	Baggage Tug	Electric	2025	40	--	211	T137-V3	Charlatte	In-Use	Off-Road
LGB-OP18-020	Belt Loader	Electric	2025	40	--	298	660E	TUG TECHNOLOGI ES, INC.	In-Use	Off-Road
LGB-OP18-021	Belt Loader	Electric	2025	40	--	298	660E	TUG TECHNOLOGI ES, INC.	In-Use	Off-Road
LGB-OP18-022	Belt Loader	Electric	2025	40	--	298	660E	TUG TECHNOLOGI ES, INC.	In-Use	Off-Road
LGB-OP18-023	A/C Tug Narrow Body	Electric	2024	132	--	257	Alpha 1	Textron	In-Use	Off-Road
LGB-OP18-024	A/C Tug Narrow Body	Electric	2024	132	--	257	Alpha 1	Textron	In-Use	Off-Road
LGB-OP18-025	Ground Power Unit	Electric	2018	150	--	177	7400 EGPU	ITW GSE	In-Use	Off-Road
LGB-OP19-001	Belt Loader	Gasoline	1972	120	--	50	Cochran- Western	701	Low-Use	Off-Road
LGB-OP19-002	Belt Loader	Gasoline	1980	120	--	50	Cochran- Western	702	Low-Use	Off-Road
LGB-OP19-003	Belt Loader	Gasoline	2015	140	--	50	TUG Inc	777	Low-Use	Off-Road
LGB-OP19-004	Passenger Stand	Gasoline	2001	140	--	50	Wollard	810	Low-Use	Off-Road
LGB-OP19-005	Passenger Stand	Gasoline	2008	140	--	50	Wollard	811	Low-Use	Off-Road
LGB-OP19-006	Passenger Stand	Gasoline	2010	140	--	50	Stinar	812	Low-Use	Off-Road
LGB-OP19-007	Baggage Tug	Gasoline	1998	140	--	50	Jet Line	935	Low-Use	Off-Road
LGB-OP19-008	Passenger Stand	Gasoline	1972	16	--	50	Skyramp	897	Low-Use	Off-Road
LGB-OP20-001	Air Conditioner	Diesel	2016	82	Tier 4	0	Air Conditioning Cart	TUG	Low-Use	Off-Road
LGB-OP20-002	Baggage Tug	Gasoline	2016	76	--	1,460	Bag Tug	TUG	In-Use	Off-Road
LGB-OP20-004	Belt Loader	Gasoline	2016	76	--	1,460	Belt Loader	TUG	In-Use	Off-Road
LGB-OP20-005	Belt Loader	Gasoline	2018	76	--	1,460	Belt Loader	TUG	In-Use	Off-Road
LGB-OP20-006	Belt Loader	Gasoline	2018	76	--	1,460	Belt Loader	TUG	In-Use	Off-Road
LGB-OP20-008	A/C Tug Narrow Body	Diesel	2016	94	Tier 4	1,460	PushBack	TLD	In-Use	Off-Road
LGB-OP20-010	Baggage Tug	Electric	2020	96	--	846	Bag Tug	EV GSE	In-Use	Off-Road
LGB-OP20-011	Ground Power Unit	Electric	2021	150	--	798	Ground Power	ITW	In-Use	Off-Road
LGB-OP20-012	Ground Power Unit	Electric	2021	150	--	798	Ground Power	ITW	In-Use	Off-Road
LGB-OP20-013	Ground Power Unit	Diesel	2016	94	Tier 4	240	GPU	TUG	In-Use	Off-Road
LGB-OP20-014	A/C Tug Narrow Body	Diesel	2025	94	Tier 4	32	Pushback	B250	In-Use	Off-Road
LGB-OP20-015	Air Conditioner	Diesel	2023	82	Tier 4	0	Air Conditioning Cart	TUG	Low-Use	Off-Road

Airport GSE ID	Equipment Type	Fuel Type	Engine Model Year	Power Rating (hp)	Engine Tier Level	Activity (hours/year)	Vehicle Description	Vehicle Manufacture	Designated Low Use	On-Road Equivalent Engine
LGB-OP31-01	Forklift	LPG	2022	67	--	589	A390V16714W	Yale	In-Use	Off-Road
LGB-OP31-02	Lift	Diesel	2024	74	Tier 4	390	TML-704	Wollard	In-Use	Off-Road
LGB-OP31-03	Cart	Electric	2016	12	--	152	IA12-48	Columbia	In-Use	Off-Road

Notes: Reported Type, Fuel Type, Engine Model Year, Power Rating, Vehicle Description, Vehicle Manufacture, Low Use Designation, and On-Road Equivalent Engine data are provided directly by airport GSE operators. A unit's Emissions Designation is the representative emissions unit's type from which its emission rates are derived. A unit's Airport GSE ID is a unique ID assigned by the airport for tracking and identification of the unit in subsequent years.

MOU SCHEDULE NO. 1 – III.B.2. List of Sold, Retired, or Relocated Equipment

For non-zero emission ground support equipment subject to this GSE measure, information regarding the sale or retirement of equipment available through CARB's DOORS system and, for pre-Tier 4 diesel, pre-2010 gasoline, or pre-2010 LPG ground support equipment relocated from LGB to another airport within the South Coast Air Basin, identify: a) the airport to which equipment is relocated, b) date of relocation, and c) estimated projected usage hours.

The annual activities for these units, presented in the MOU Schedule No. 1 – III.B.1. List of Ground Support Equipment table and in the table below are prorated to account for equipment in operation at the airport for fewer than 12 months of the reporting year.

The following pre-Tier 4 diesel, pre-2010 gasoline, or pre-2010 LPG ground support equipment at Long Beach Airport was identified as having been retired, scrapped, relocated, or sold in the reporting year.

Airport GSE ID	Equipment Type	Fuel Type	Engine Model Year	Power Rating (hp)	Engine Tier Level	Activity at LGB (hours)	Designated Low Use	On-Road Equivalent Engine	Retired / Transferred?
LGB-OP07-025	Ground Power Unit	Diesel	2019	74	Tier 4	796	In-Use	Off-Road	Moved from LGB to other airport (SMO; 2025)
LGB-OP08-006	Fuel Truck	Gasoline	1995	300	--	41	In-Use	Off-Road	Sold (July 2025 to Field Vendor)
LGB-OP08-030	Service Truck	Gasoline	1994	160	--	0	In-Use	On-Road	Sold (August 2024)
LGB-OP13-007	Baggage Tug	Gasoline	2016	40	--	345	In-Use	Off-Road	Moved from LGB to other airport (Moved to LAX 5/20/2025)
LGB-OP16-022	Ground Power Unit	Diesel	2010	155	Tier 3	396	In-Use	Off-Road	Moved from LGB to other airport (2025; non-basin)
LGB-OP18-006	Belt Loader	Gasoline	2019	64	--	511	In-Use	Off-Road	Moved to SNA 9-22-25
LGB-OP18-009	A/C Tug Narrow Body	Diesel	2019	75	Tier 4	154	In-Use	Off-Road	Moved to ONT 5-27-2025
LGB-OP18-010	A/C Tug Narrow Body	Diesel	2019	84	Tier 4	275	In-Use	Off-Road	Moved from LGB to other out of state airport (9-19-2025 (SGF))
LGB-OP18-011	Belt Loader	Diesel	2014	49	Tier 4	282	In-Use	Off-Road	Moved to ONT 5-27-2025
LGB-OP20-013	Ground Power Unit	Diesel	2016	94	Tier 4	240	In-Use	Off-Road	Moved from LGB to other airport (March 2025- was only here a couple months)

MOU SCHEDULE NO. 1 – III.B.3. Emission Inventory

An annual emission inventory for all ground support equipment associated with commercial operations at LGB, including methodology and calculations.

Fleet Mix					Emissions (tons per year; metric tons for CO ₂ e)						
Total	Electric	Diesel	Gas	Other	CO	ROG	NO _x	PM ₁₀	PM _{2.5}	SO _x	CO ₂ e
184	110	35	33	6	14.1	0.7	2.5	0.12	0.10	<0.01	1,457

Notes:

1. Fleet counts include ≥ 25 horsepower in-use equipment used in the calculation of the NO_x performance factor.
2. Fleet emissions include the operation of all reported equipment, including <25 horsepower and low-use (<200 hours per year) equipment.

Fleet NO_x performance factor:

0.38 grams per brake horsepower-hour

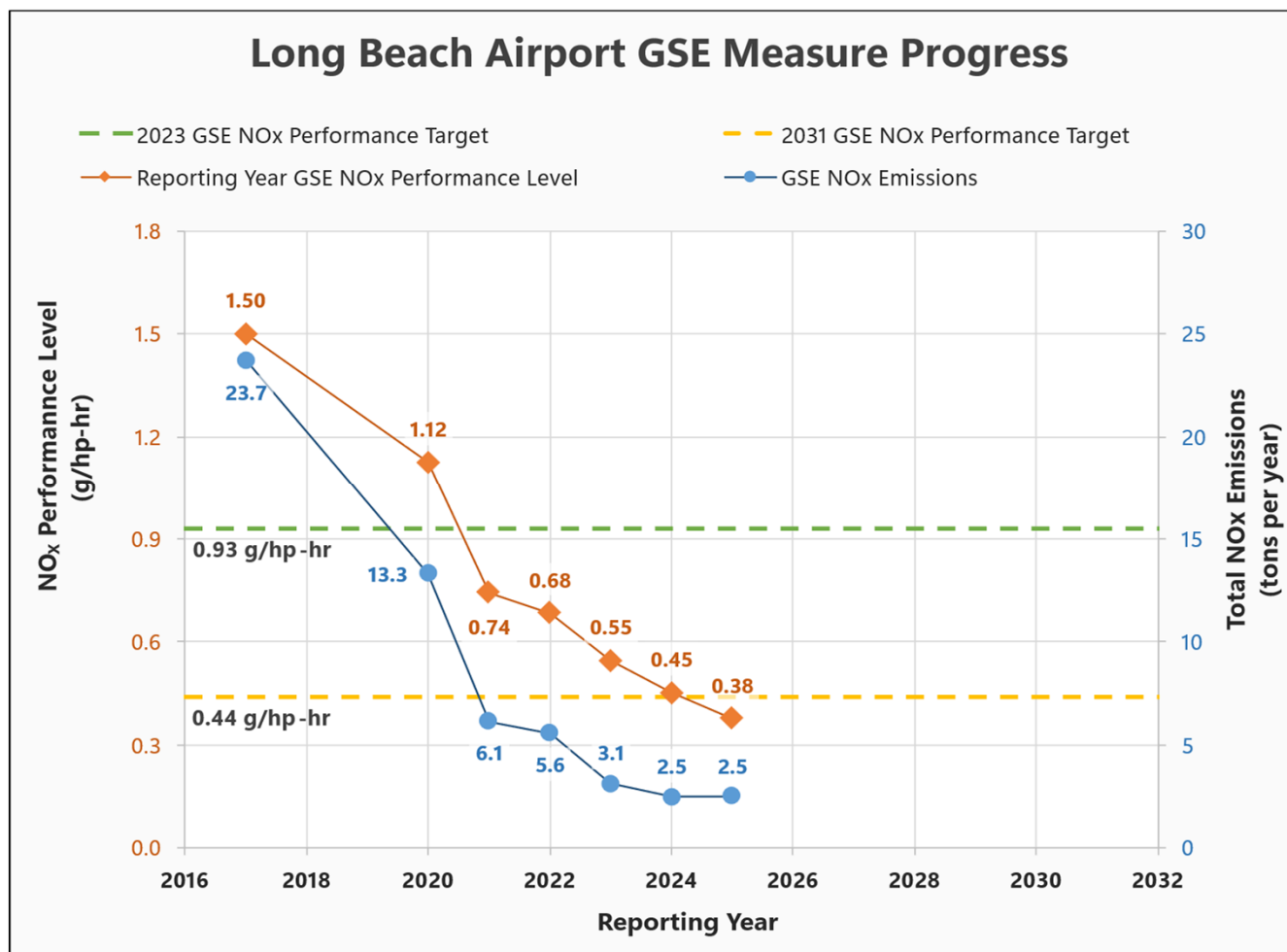


Exhibit B

*MOU Schedule No. 1 – Calendar Year 2025 Ground Support
Equipment Survey Emissions Inventory Report, May 2026*

**COMMERCIAL
AIRPORTS MOU
SUPPORT**

**MOU Schedule No. 1
Ground Support Equipment**

**2025 Survey and Inventory Report
May 2026**



long beach
airport

May 2026

**CDM
Smith**

Section 1

Project Information

Project Title: MOU Schedule No. 1 - Ground Support Equipment Survey Support

Airport Code: LGB

Airport Name: Long Beach Airport

Airport Owner: City of Long Beach

Key Contacts:

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1.1 MOU Background

In December 2019, the City of Long Beach, the owner and operator of Long Beach Airport (“LGB” or “the Airport”), entered into a voluntary Memorandum of Understanding (MOU) with the South Coast Air Quality Management District (South Coast AQMD) for the purpose of reducing emissions of criteria air pollutants at the airport. Schedule No. 1 of the MOU establishes Ground Support Equipment (GSE) fleet-average oxides of Nitrogen (NO_x) performance targets to be achieved at the airport by January 1, 2023, and January 1, 2031.

The purpose of the MOU is to reduce emissions of oxides of Nitrogen (NO_x) at the Airport by encouraging adoption of low- and zero-emission GSE as an alternative to conventional high-emission fossil fuel equipment. The MOU sets NO_x fleet-average performance targets of 0.93 grams NO_x per brake horsepower-hour by 2023 and 0.44 grams NO_x per brake horsepower-hour by 2031. The MOU allows discretion in the means by which the Airport is to achieve these targets, including through leases, licenses, operational requirements, or other agreements.

Beginning on June 1, 2021 and continuing each year thereafter through 2032, LGB is required to collect and report information regarding GSE operating at the airport to the South Coast AQMD. The Airport is also required to collect and report information pertaining to the sale or retirement of non-zero equipment retired under the MOU. Additionally, annual emissions inventories are required to be developed and reported based on the collected GSE data. This report details the results of the reporting year 2025 LGB GSE survey and associated emissions inventory.

Section 2

Methodology

Data collected for the 2025 GSE survey were analyzed, and emissions related to their operation were estimated using industry standard models and assumptions following a methodology consistent with the Technical Support Documentation for the MOU, as detailed below.

2.1 Collection of Data

In February 2026, reporting forms were distributed to all known operators of commercial GSE at the airport. Operators were supplied with the final versions of their fleet reporting forms from the previous MOU reporting year and were instructed to provide information on any equipment added to their fleet during the reporting year and to verify the data for the existing fleet, which included the model years, horsepower ratings, equipment categories, fuel types, and other identifying characteristics of the GSE in operation at the airport. Operators were instructed to specify the status of all previously reported equipment and, if the status of that equipment had changed, to indicate the nature of the change (such as a unit of GSE having been scrapped, relegated to emergency use, or relocated to a different airport). Operators were also instructed to provide specific dates for the status change. For equipment relocated to a different airport, operators were instructed to further report to which airport the equipment was relocated.

All operators had completed and submitted the reporting forms by the end of April. Additional follow-up with operators was completed throughout May.

Each unit of reported GSE was reviewed for accuracy and program applicability based on previously submitted data, MOU requirements, and professional judgment. Non-electric GSE with power ratings less than or equal to 25 horsepower are exempt from the California Air Resources Board (CARB) in-use off-road diesel-fueled (ORD) fleets and large spark-ignition (LSI) fleets regulations, upon which the MOU's GSE agreement is predicated, and thus are excluded from the performance level calculations. Consistent with the MOU requirements, low-use equipment, as defined in CARB's ORD Rule, are also excluded from performance level calculations. Both non-electric GSE with power ratings less than or equal to 25 horsepower and low- and emergency-use equipment were retained in the inventory for the purposes of determining total annual NO_x emissions from GSE. Emergency-use equipment was evaluated as low-use equipment, excluded from performance calculations, and assumed to operate 200 hours for emission calculations to account for emergency use.

Quality review was performed for each reported unit and adjustments were made to irregular data as needed. Such adjustments may include but are not limited to: adjustments to engine model year, horsepower, or fuel type data based on discussions with equipment operators or review of previously reported data; and the use of surrogate horsepower or model year data for equipment for which such data was not reported or otherwise attainable from manufacturer specifications or prior reports. For units which were reported without complete horsepower or

model year data, the average horsepower or model year for similar equipment in-use at the airport were used.

A detailed breakdown of all reported GSE is included in **Attachment A** to this report.

2.2 Performance Calculations

The fleet performance factor was estimated using California regulatory standard emissions models, OFFROAD2017 and EMFAC2017, developed by CARB. For each unit of GSE, a representative equipment type was identified from either the OFFROAD2017 model (for off-road engine units) or EMFAC2017 model (for on-road engine units) based on Table 2-3 in the *Long Beach Airport AQIP Technical Support Document*. Emission factors from the emissions models were queried for the Los Angeles (South Coast) region for CY 2025, assuming all adopted rules for exhaust controls. All fuel types, model years, and horsepower bins (OFFROAD2017 only) were selected, and an aggregated speed was assumed (EMFAC2017 only). Emission factors were assigned to each reported unit of GSE based on the GSE category, model year, horsepower rating, and fuel type of the equipment.

Emission factors were obtained in units of grams per brake horsepower-hour from OFFROAD2017, and in units of grams per mile from EMFAC2017. For equipment paired to the EMFAC2017 model, an average on-airport speed of 15 miles per hour was multiplied against the model's emission factor and the resulting factor was divided by a reported equipment's respective horsepower to convert to the appropriate grams per brake horsepower-hour unit. The resultant factors, with units of grams per brake horsepower-hour, were weighted by reported equipment horsepower and averaged to determine the NO_x fleet performance factor.

2.3 Emission Calculations

On July 12, 2021, it was determined that the publicly available version of CARB's OFFROAD2017 model did not incorporate the engine-standard requirements associated with CARB's 2006 LSI rulemaking and subsequent 2010 amendments. These standards required new LSI equipment certified for sale in the state of California to meet stringent emission standards for NO_x and hydrocarbons which far exceeded previous requirements. As a result, LSI engine emissions calculated using the OFFROAD2017 factors resulted in vastly overpredicted emissions, particularly for new equipment. South Coast AQMD was informed of this discrepancy and discussed the issue with CARB on July 14, 2021. Updated emission factors were developed by CARB based on actual historical engine certifications in the state of California since the 2006 rulemaking came into effect. These updated factors were provided initially on July 16, 2021, and updated on July 23, 2021, with final load factors and deterioration caps provided on August 13, 2021. These finalized LSI factors were used alongside CARB's ORDAS factors for diesel equipment (which also incorporated the most recent engine standard requirements) to develop the emissions inventory.

Although the emission factors were updated, the fundamental calculation methodology was not changed from the methodology used in the 2017 AQIP and MOU. Equipment categories were paired to each reported unit and emission factors were looked up based on the model year, fuel type, horsepower rating, and equipment category of a given unit. In the CY 2017 MOU calculations, base emission factors were back calculated from the OFFROAD2017 model's tons

per year per equipment population outputs. The CARB-provided updated base factors were calculated using zero-hour emissions, emission deterioration rates, fuel correction factors, and load factors.

Per unit emissions were calculated using the following formula and summed across all equipment listed at the airport to determine the fleet-total emissions:

$$\text{Emissions (grams per year)} = \text{Activity (hours per year)} \times \text{Power Rating (horsepower)} \times \text{Load Factor (dimensionless)} \times \{ \text{Zero-hour Emission Factor (grams per brake horsepower-hour)} + [\text{Deterioration Rate (grams per brake horsepower-hour per hour)} \times \text{Equipment Lifetime Cumulative Operational Hours (hours)}] \} \times \text{Fuel Correction Factor (dimensionless)}$$

Table 1. GSE Category Pairing with OFFROAD2017 Equipment and Fuel Types

GSE Category ¹	OFFROAD Category (Diesel)	GSE Category ¹	OFFROAD Category (Gasoline & Nat Gas)
Air Conditioner	Portable Equipment - Non-Rental Generator	Air Conditioner	OFF - AirGrSupp - Air Conditioner
Aircraft Tug	AirGrSupp - A/C Tug Narrow Body	Aircraft Tug	OFF - AirGrSupp - A/C Tug Narrow Body
Air Start Unit	Portable Equipment - Non-Rental Generator	Air Start Unit	OFF - AirGrSupp - Air Start Unit
Baggage Tug	AirGrSupp - Baggage Tug	Baggage Tug	OFF - AirGrSupp - Baggage Tug
Belt Loader	AirGrSupp - Belt Loader	Belt Loader	OFF - AirGrSupp - Belt Loader
Cargo Loader	AirGrSupp - Cargo Loader	Cargo Loader	OFF - AirGrSupp - Cargo Loader
Cargo Tractor	AirGrSupp - Cargo Tractor	Cargo Tractor	OFF - AirGrSupp - Cargo Tractor
Cart	AirGrSupp - Cart	Cart	OFF - AirGrSupp - Cart
Catering Truck	AirGrSupp - Other GSE	Catering Truck	OFF - AirGrSupp - Catering Truck
Forklift	AirGrSupp - Forklift	Forklift	OFF - AirGrSupp - Forklift
Fuel Truck	AirGrSupp - Other GSE	Fuel Truck	OFF - AirGrSupp - Fuel Truck
Generator	Portable Equipment - Non-Rental Generator	Generator	OFF - AirGrSupp - Generator
Ground Power Unit	AirGrSupp - Other GSE	Ground Power Unit	OFF - AirGrSupp - Ground Power Unit
Lavatory Cart	AirGrSupp - Other GSE	Lavatory Cart	OFF - AirGrSupp - Lav Cart
Lavatory Truck	AirGrSupp - Other GSE	Lavatory Truck	OFF - AirGrSupp - Lav Truck
Lift	AirGrSupp - Lift	Lift	OFF - AirGrSupp - Lift
Maintenance Truck	AirGrSupp - Other GSE	Maintenance Truck	OFF - AirGrSupp - Maint. Truck
Other GSE	AirGrSupp - Other GSE	Other GSE	OFF - AirGrSupp - Other GSE
Passenger Stand	AirGrSupp - Passenger Stand	Passenger Stand	OFF - AirGrSupp - Passenger Stand
Service Truck	AirGrSupp - Other GSE	Service Truck	OFF - AirGrSupp - Service Truck
Sweeper	ConstMin - Sweepers/Scrubbers	Sweeper	OFF - AirGrSupp - Sweeper
Water Truck	AirGrSupp - Other GSE	Water Truck	OFF - AirGrSupp - Water Truck

Notes:

1. The OFFROAD2017 model does not include emission factors for every combination of vehicle category, fuel type, and engine model year. For units in which no appropriate vehicle category, fuel type, and model year pairing exists, the "Other GSE" vehicle category was used in the estimation of emission factors.

Section 3

GSE Inventory

The reporting year 2025 GSE inventory for the Airport is presented below.

3.1 GSE Operators

Table 2 presents airport tenants identified as GSE operators in the reporting year.

Table 2. LGB GSE Operators

Commercial ¹	Noncommercial
AGI (Delta Air Lines)	Aero City Maintenance
Airserv	Aeroplex (FBO)
Alaska Airlines	Gulfstream
Atlantic Aviation (FBO)	LA County Sheriff's Dept. Aero Bureau
Catalina Flying Boats	Long Beach Flying Club and Flight Academy
Signature Aviation	OCR Aviation
Southwest Airlines	Olen Properties
Unifi Aviation (Hawaiian Airlines)	Quinn Group
UPS	
West Coast Aircraft Maintenance	

Notes:

1. Commercial operators are defined as those operators supporting commercial aviation, including passenger airlines, cargo operations, or charter operations. Consistent with the MOU requirements and with the concurrence of South Coast AQMD staff, only GSE associated with commercial operations are included in the annual MOU GSE surveys.

2. In 2022, Gulfstream divested the last of its fulfillment center operations at the Airport. Gulfstream now only provides maintenance support to private jet owners visiting the Airport, and its remaining operations are considered noncommercial.

3.2 Equipment Breakdown

Table 3 presents a summary of GSE by category and fuel type for the reporting year.

Table 3. Count of Commercial Equipment by GSE Category and Fuel Type

GSE Category	Total Reported Equipment ¹	Electric	Diesel	Gasoline	LPG/Propane
Aircraft Tug	22	14	8	0	0
Air Conditioner	8	7	1	0	0
Air Start Unit	3	0	3	0	0
Baggage Tug	55	49	0	6	0
Belt Loader	22	16	1	5	0
Cargo Loader	4	0	2	2	0
Cargo Tractor	--	--	--	--	--
Cart	6	6	0	0	0
Catering Truck	1	0	0	1	0
Forklift	7	0	0	1	6
Fuel Truck	16	0	12	4	0
Generator	0	0	0	0	0
Ground Power Unit	20	13	7	0	0
Lavatory Cart	2	2	0	0	0
Lavatory Truck	1	0	0	1	0
Lift	2	1	1	0	0
Maintenance Truck	--	--	--	--	--
Other GSE	--	--	--	--	--
Passenger Stand	9	0	0	9	0
Service Truck	4	0	0	4	0
Sweeper	2	2	0	0	0
Water Truck	--	--	--	--	--
Total	184	110	35	33	6

Key: GSE = ground support equipment; LPG = liquefied petroleum gas

Note:

1. Equipment counts exclude non-electric equipment less than 25 horsepower and low-use equipment.

3.3 Emissions Inventory

Table 4 presents the summary of emissions by GSE category for the reporting year.

Table 4. Commercial Emissions by GSE Category

GSE Category	Emissions (tons per year; metric tons per year for CO ₂ e)						
	CO	ROG	NO _x	PM ₁₀	PM _{2.5}	SO _x	CO ₂ e
Aircraft Tug	0.9	0.1	0.6	0.03	0.03	<0.01	150
Air Conditioner	0.1	<0.1	<0.1	<0.01	<0.01	<0.01	10
Air Start Unit	<0.1	<0.1	<0.1	<0.01	<0.01	<0.01	14
Baggage Tug	3.5	0.1	0.2	0.01	0.01	<0.01	161
Belt Loader	3.5	0.1	0.2	0.01	0.01	<0.01	189
Cargo Loader	0.6	<0.1	<0.1	<0.01	<0.01	<0.01	63
Cargo Tractor	--	--	--	--	--	--	--
Cart	--	--	--	--	--	--	--
Catering Truck	<0.1	<0.1	<0.1	<0.01	<0.01	<0.01	26
Forklift	1.9	0.2	0.6	0.01	0.01	<0.01	62
Fuel Truck	2.4	0.1	0.4	0.04	0.03	<0.01	660
Generator	<0.1	<0.1	<0.1	<0.01	<0.01	<0.01	4
Ground Power Unit	0.3	<0.1	0.2	0.01	0.01	<0.01	57
Lavatory Cart	--	--	--	--	--	--	--
Lavatory Truck	<0.1	<0.1	<0.1	<0.01	<0.01	<0.01	6
Lift	<0.1	<0.1	<0.1	<0.01	<0.01	<0.01	6
Maintenance Truck	--	--	--	--	--	--	--
Other GSE	--	--	--	--	--	--	--
Passenger Stand	0.6	0.1	0.1	<0.01	<0.01	<0.01	42
Service Truck	<0.1	<0.1	<0.1	<0.01	<0.01	<0.01	3
Sweeper	0.3	<0.1	<0.1	<0.01	<0.01	<0.01	1
Water Truck	--	--	--	--	--	--	--
Total	14.1	0.7	2.5	0.12	0.10	0.01	1,457

Key: CO = carbon monoxide; CO₂e = carbon dioxide equivalents; GSE = ground support equipment; NO_x = oxides of nitrogen; PM₁₀ = particulate matter with an aerodynamic diameter less than or equal to 10 microns; PM_{2.5} = particulate matter with an aerodynamic diameter less than or equal to 2.5 microns; ROG = reactive organic gases; SO_x = oxides of sulfur

3.4 Fleet-Wide Performance Level and Emissions

The Airport's fleet-wide NO_x performance factor for commercial GSE in the 2025 reporting year was 0.38 grams per brake horsepower-hour, achieving the 2031 target of 0.44 grams per brake horsepower-hour.

The Airport's fleet-wide NO_x emissions from commercial GSE in the 2025 reporting year totaled 2.5 tons of NO_x, reflecting a 89.5 percent reduction relative to the fleet-wide emissions at GSE program inception. **Figure 1** presents the historical fleet-wide NO_x performance factor by survey year.

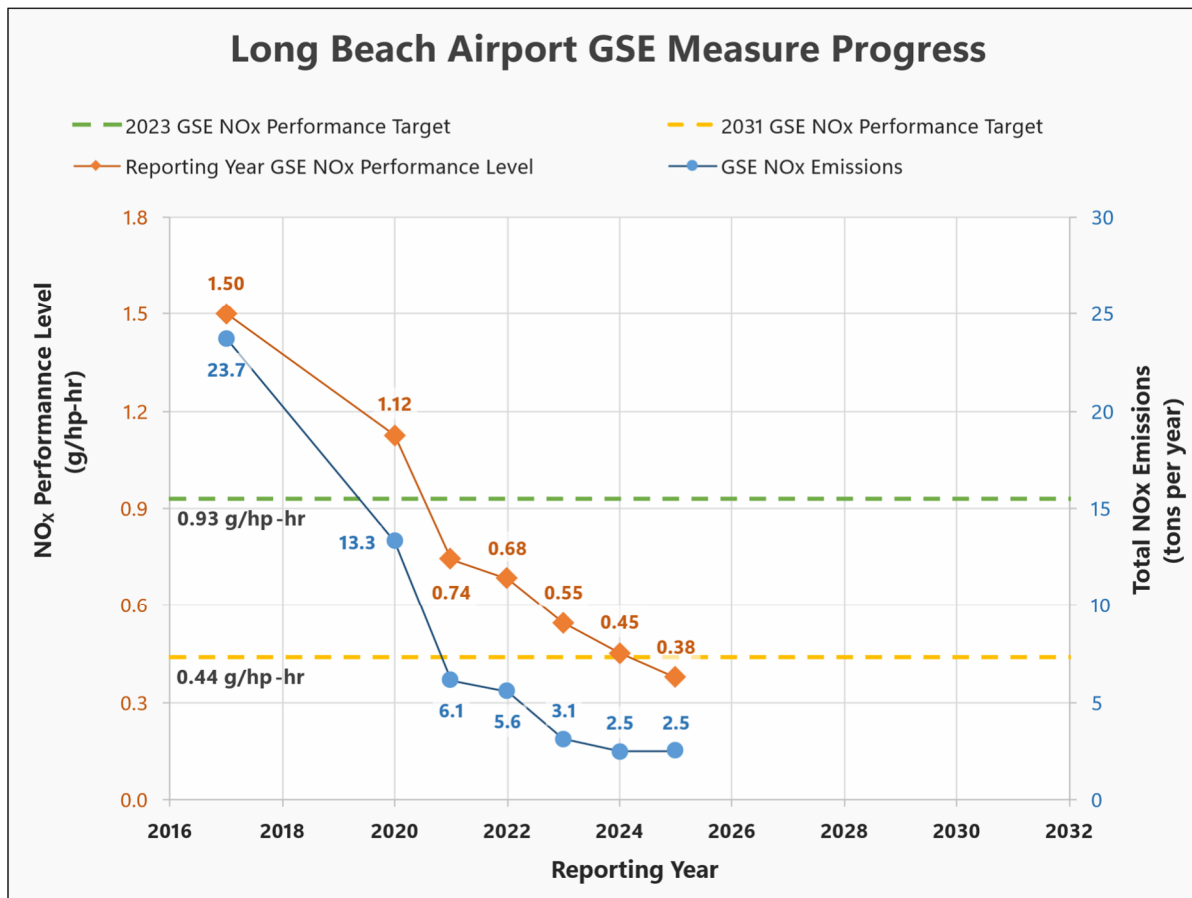


Figure 1. GSE Program Fleet-Wide Commercial NO_x Performance Level and Emissions by Survey Year

Attachment A

Detailed Commercial GSE Data and Emissions

2025 LGB Commercial GSE Survey — Progress To-Date

Survey Year	Count of Equipment ^[1]	Percent Electric ^[1]	OFFROAD Method NO _x ^{[2][3]} (short tons)	CARB Factors Method NO _x ^{[2][4]} (short tons)	MOU Fleet Performance NO _x ^{[1][5][6]} (g/hp-hr)
2017	320	48.4%	16.8	23.7	1.50
2018					
2019					
2020	248	38.7%	16.0	13.3	1.12
2021	160	46.9%	--	6.1	0.74
2022	164	50.6%	--	5.6	0.68
2023	173	55.5%	--	3.1	0.55
2023				Performance Target:	0.93
2024	182	59.3%	--	2.5	0.45
2025	184	59.8%	--	2.5	0.38
2026					
2027					
2028					
2029					
2030					
2031					
2031				Performance Target:	0.44
2032					

Notes:

[1] Excludes <25hp non-electric, low-use, and emergency-use equipment; Includes both new and removed equipment that operated at any point in reporting period.

[2] Includes <25hp non-electric, low-use, emergency-use, and both new and removed equipment that operated at any point in reporting period.

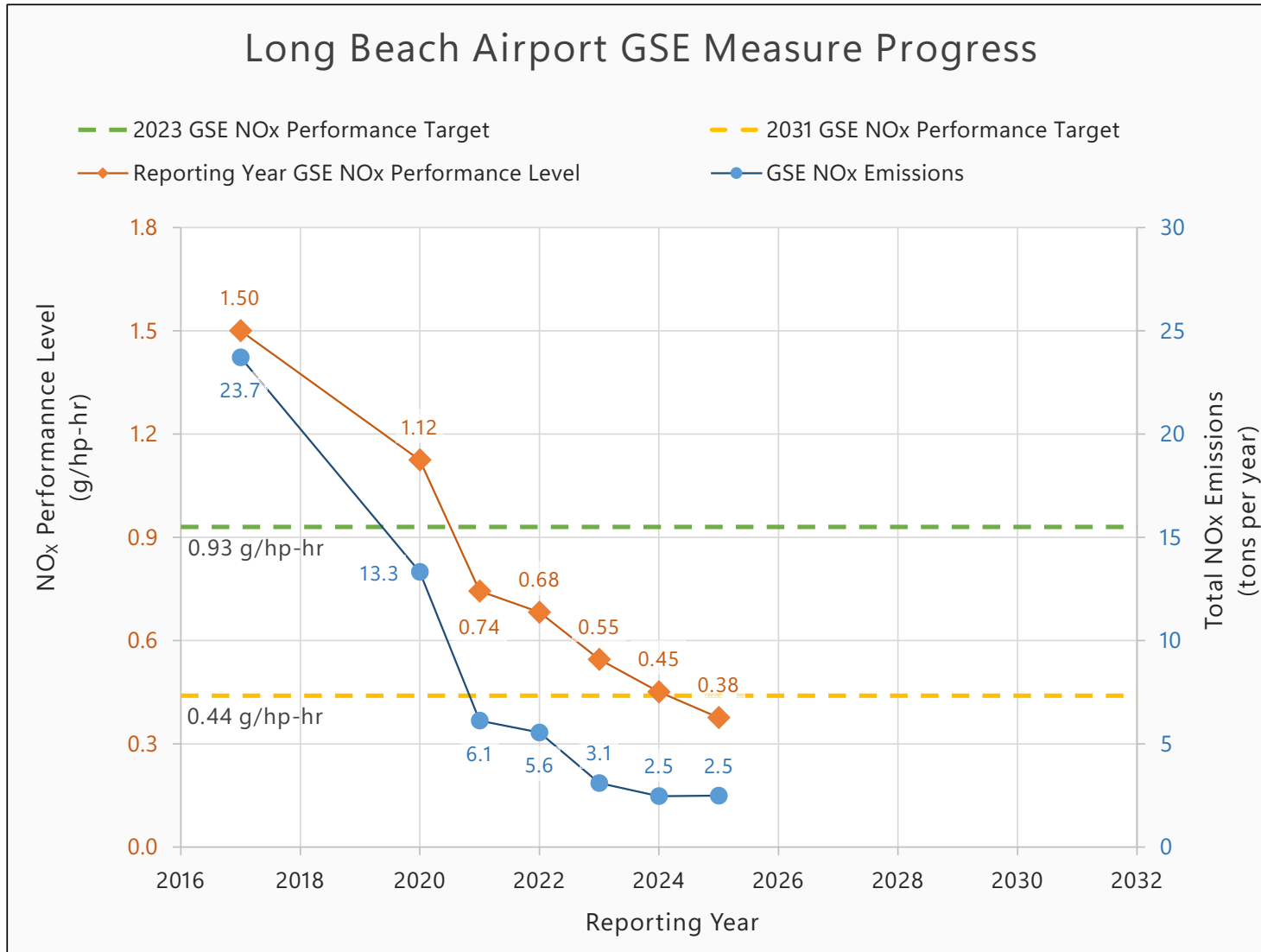
[3] Emission factors back-calculated from OFFROAD2017 outputs (outdated LSI emission factors).

[4] Emission factors provided by CARB July 2021 based on certified engine standards (LSI) and 2017 ORDAS model (ORD).

[5] Calculated as a fully-loaded horsepower-weighted factor consistent with the methodology employed throughout the development of the **SCAQMD and City of Long Beach 2019 MOU**.

[6] Reporting year 2020 performance factor calculated using emission factors provided by CARB July 2021 based on certified engine standards (LSI) and 2017 ORDAS model (ORD). Reporting year 2017 factor and targets for years 2023 and 2031 based on back-calculated emission factors from the OFFROAD2017 model.

2025 LGB Commercial GSE Survey — Progress To-Date



2025 LGB Commercial GSE Survey — Progress To-Date

Airport-wide Reportable GSE Fleet Equipment Inventory Excludes <25hp non-electric, low-use, and emergency-use equipment; Includes both new and removed equipment that operated at any point in reporting period.					
	Diesel	Gasoline	LPG	Electric	Total
Overall Fleet	35	33	6	110	184
Overall Fleet Percent	19.0%	17.9%	3.3%	59.8%	--
A/C Tug Narrow Body	8	0	0	14	22
Air Conditioner	1	0	0	7	8
Air Start Unit	3	0	0	0	3
Baggage Tug	0	6	0	49	55
Belt Loader	1	5	0	16	22
Cargo Loader	2	2	0	0	4
Cart	0	0	0	6	6
Catering Truck	0	1	0	0	1
Forklift	0	1	6	0	7
Fuel Truck	12	4	0	0	16
Generator	0	0	0	0	0
Ground Power Unit	7	0	0	13	20
Lav Cart	0	0	0	2	2
Lav Truck	0	1	0	0	1
Lift	1	0	0	1	2
Passenger Stand	0	9	0	0	9
Service Truck	0	4	0	0	4
Sweeper	0	0	0	2	2

2025 LGB Commercial GSE Survey — Progress To-Date

Airport-wide Total GSE Fleet Equipment Inventory <i>Includes</i> <25hp non-electric, low-use, emergency-use, and both new and removed equipment that operated at any point in reporting period.						
	In-Use	Low- or Emergency-Use	New Equipment	Removed Equipment	Total (all reported)	Electric (all reported)
Overall Fleet	188	10	18	22	198	110
Overall Fleet Percent	94.9%	5.1%	--	--	--	--
A/C Tug Narrow Body	22	1	3	2	23	14
Air Conditioner	8	0	1	0	8	7
Air Start Unit	3	0	0	0	3	0
Baggage Tug	55	1	4	11	56	49
Belt Loader	22	3	3	4	25	16
Cargo Loader	4	0	0	0	4	0
Cart	6	0	1	0	6	6
Catering Truck	1	0	0	0	1	0
Forklift	7	0	1	0	7	0
Fuel Truck	16	0	0	1	16	0
Generator	4	0	0	0	4	0
Ground Power Unit	20	0	3	3	20	13
Lav Cart	2	0	0	0	2	2
Lav Truck	1	0	0	0	1	0
Lift	2	0	1	0	2	1
Passenger Stand	9	4	1	0	13	0
Service Truck	4	0	0	1	4	0
Sweeper	2	1	0	0	3	2

2025 LGB Commercial GSE Survey — Progress To-Date

Airport-wide Total GSE Fleet Emissions Inventory <i>Includes</i> <25hp non-electric, low-use, emergency-use, and both new and removed equipment that operated at any point in reporting period.							
	ROG (short tons)	CO (short tons)	NO _x (short tons)	PM ₁₀ (short tons)	PM _{2.5} (short tons)	CO ₂ e (metric tons)	SO _x (short tons)
Overall Fleet	0.7	14.1	2.5	0.12	0.10	1,457	0.01
Overall Fleet Percent	--	--	--	--	--	--	--
A/C Tug Narrow Body	0.1	0.9	0.6	0.03	0.03	150	<0.01
Air Conditioner	<0.1	0.1	<0.1	<0.01	<0.01	10	<0.01
Air Start Unit	<0.1	<0.1	<0.1	<0.01	<0.01	14	<0.01
Baggage Tug	0.1	3.5	0.2	0.01	0.01	161	<0.01
Belt Loader	0.1	3.5	0.2	0.01	0.01	189	<0.01
Cargo Loader	<0.1	0.6	<0.1	<0.01	<0.01	63	<0.01
Cart	--	--	--	--	--	--	--
Catering Truck	<0.1	<0.1	<0.1	<0.01	<0.01	26	<0.01
Forklift	0.2	1.9	0.6	0.01	0.01	62	<0.01
Fuel Truck	0.1	2.4	0.4	0.04	0.03	660	<0.01
Generator	<0.1	<0.1	<0.1	<0.01	<0.01	4	<0.01
Ground Power Unit	<0.1	0.3	0.2	0.01	0.01	57	<0.01
Lav Cart	--	--	--	--	--	--	--
Lav Truck	<0.1	<0.1	<0.1	<0.01	<0.01	6	<0.01
Lift	<0.1	<0.1	<0.1	<0.01	<0.01	6	<0.01
Passenger Stand	0.1	0.6	0.1	<0.01	<0.01	42	<0.01
Service Truck	<0.1	<0.1	<0.1	<0.01	<0.01	3	<0.01
Sweeper	<0.1	0.3	<0.1	<0.01	<0.01	1	<0.01

2025 LGB Commercial GSE Survey — Progress To-Date

Condensed Summary of GSE Fuel Type and Tier Rating Changes

2025 (change vs 2024)

Fleet Inventory Equipment Count

Excludes low-use equipment, <25 hp non-electric equipment.

Overall Fleet	184 (+2)
Diesel	35 (-)
<i>Tier 4</i>	23 (+1)
<i>Tier 4i</i>	3 (-)
<i>Tier 3</i>	2 (+1)
<i>Tier 2</i>	0 (-)
<i>Tier 1</i>	0 (-1)
<i>Tier 0</i>	0 (-)
<i>On-Road</i>	7 (-1)
Gasoline	33 (-1)
<i>Pre-2010</i>	2 (-2)
<i>2010 and Newer</i>	31 (+1)
LPG	6 (+1)
<i>Pre-2010</i>	4 (-)
<i>2010 and Newer</i>	2 (+1)
Electric	110 (+2)

2025 (change vs 2019)

Fleet Inventory Equipment Count

Excludes low-use equipment, <25 hp non-electric equipment.

Overall Fleet	184 (-136)
Diesel	35 (-63)
<i>Tier 4</i>	23 (+14)
<i>Tier 4i</i>	3 (+1)
<i>Tier 3</i>	2 (-1)
<i>Tier 2</i>	0 (-13)
<i>Tier 1</i>	0 (-52)
<i>Tier 0</i>	0 (-19)
<i>On-Road</i>	7 (+7)
Gasoline	33 (-16)
<i>Pre-2010</i>	2 (-34)
<i>2010 and Newer</i>	31 (+18)
LPG	6 (-12)
<i>Pre-2010</i>	4 (-11)
<i>2010 and Newer</i>	2 (-1)
Electric	110 (-45)

2025 LGB Commercial GSE Survey — Progress To-Date

Comparison of Engine Tier & Horsepower Rating by Reporting Year (Diesel-Fueled Equipment)

Excludes low-use equipment and <25 hp non-electric equipment.

2025 Fleet (difference as compared to 2024)

Tier	Horsepower Bin									Total
	<25	25 - 49	50 - 74	75 - 99	100 - 174	175 - 299	300 - 599	600 - 749	≥ 750	
Tier 0	0 (-)	0 (-)	0 (-)	0 (-)	0 (-)	0 (-)	0 (-)	0 (-)	0 (-)	0 (-)
Tier 1	0 (-)	0 (-)	0 (-)	0 (-)	0 (-)	0 (-1)	0 (-)	0 (-)	0 (-)	0 (-1)
Tier 2	0 (-)	0 (-)	0 (-)	0 (-)	0 (-)	0 (-)	0 (-)	0 (-)	0 (-)	0 (-)
Tier 3	0 (-)	0 (-)	0 (-)	1 (+1)	1 (-)	0 (-)	0 (-)	0 (-)	0 (-)	2 (+1)
Tier 4i	0 (-)	0 (-)	0 (-)	0 (-)	1 (-)	2 (-)	0 (-)	0 (-)	0 (-)	3 (-)
Tier 4	4 (-)	2 (-)	3 (+2)	6 (+2)	5 (-3)	4 (-)	3 (-)	0 (-)	0 (-)	23 (+1)
Total										28 (-4)

Note. Totals exclude <25 hp equipment.

2025 Fleet (difference as compared to 2019 reporting year [based on 2017 fleet])

Tier	Horsepower Bin									Total
	<25	25 - 49	50 - 74	75 - 99	100 - 174	175 - 299	300 - 599	600 - 749	≥ 750	
Tier 0	0 (-)	0 (-2)	0 (-)	0 (-1)	0 (-15)	0 (-1)	0 (-)	0 (-)	0 (-)	0 (-19)
Tier 1	0 (-)	0 (-26)	0 (-1)	0 (-3)	0 (-19)	0 (-2)	0 (-)	0 (-1)	0 (-)	0 (-52)
Tier 2	0 (-)	0 (-)	0 (-3)	0 (-3)	0 (-6)	0 (-)	0 (-)	0 (-1)	0 (-)	0 (-13)
Tier 3	0 (-)	0 (-)	0 (-)	1 (+1)	1 (-)	0 (-)	0 (-1)	0 (-1)	0 (-)	2 (-1)
Tier 4i	0 (-)	0 (-)	0 (-1)	0 (-)	1 (-)	2 (+2)	0 (-)	0 (-)	0 (-)	3 (+1)
Tier 4	4 (+4)	2 (-1)	3 (+2)	6 (+5)	5 (+2)	4 (+3)	3 (+3)	0 (-)	0 (-)	23 (+14)
Total										28 (-70)

Note. Totals exclude <25 hp equipment.

2025 LGB Commercial GSE Survey — Progress To-Date

Comparison of Engine Model Year & Fuel Type by Reporting Year

Excludes low-use equipment and <25 hp non-electric equipment.

2025 Fleet (difference as compared to 2024)

Model Year	Fuel Type				Total
	Gasoline	LPG/Propane	Electric	Diesel	
≤ 2007	2 (-2)	4 (-)	21 (-8)	1 (-1)	28 (-11)
2008 - 2009	0 (-)	0 (-)	2 (-1)	0 (-)	2 (-1)
2010 - 2015	2 (-)	1 (-)	11 (-1)	12 (+1)	26 (-)
2016 - 2020	25 (-)	0 (-)	16 (+2)	13 (-2)	54 (-)
≥ 2021	4 (+1)	1 (+1)	60 (+10)	9 (+2)	74 (+14)
Total:	33 (-1)	6 (+1)	110 (+2)	35 (-)	184 (+2)

2025 Fleet (difference as compared to 2019 reporting year [based on 2017 fleet])

Model Year	Fuel Type				Total
	Gasoline	LPG/Propane	Electric	Diesel	
≤ 2007	2 (-25)	4 (-9)	21 (-74)	1 (-84)	28 (-192)
2008 - 2009	0 (-9)	0 (-2)	2 (-5)	0 (-3)	2 (-19)
2010 - 2015	2 (-7)	1 (+1)	11 (-26)	12 (+8)	26 (-24)
2016 - 2020	25 (+21)	0 (-3)	16 (-)	13 (+7)	54 (+25)
≥ 2021	4 (+4)	1 (+1)	60 (+60)	9 (+9)	74 (+74)
Total:	33 (-16)	6 (-12)	110 (-45)	35 (-63)	184 (-136)

