

## Non-road Mobile Sources

Section 209(e) of the Clean Air Act (CAA) preempts states other than California from adopting or enforcing emissions standards for terrestrial and marine non-road engines or vehicles. Similarly, CAA section 233 preempts states from adopting or enforcing emissions standards from aircraft or aircraft engines. For this reason, the Utah Division of Air Quality (UDAQ) did not consider any SIP controls for non-road mobile sources beyond those already promulgated at the federal level. Nevertheless, emissions reduction credit for these federal controls was accounted for because their effectiveness has been incorporated into the NONROAD model which UDAQ uses to calculate non-road emissions.

In 2016, non-road mobile sources were responsible for approximately 15.23% of NO<sub>x</sub>, 8.99% of VOC, 5.62% of PM<sub>2.5</sub>, 0.29% of NH<sub>3</sub>, and 5.59% of SO<sub>2</sub> in the Salt Lake Nonattainment Area. Among non-road sources, railroad equipment emitted the most NO<sub>x</sub> at 6.32% of the total NO<sub>x</sub> inventory, followed by off-highway diesel vehicles at 5.46% and aircraft at 1.99%, with the remainder being made up from all other non-road sources combined. The largest non-road VOC contributors were off-highway gasoline 2-stroke equipment at 4.29%, off-highway gasoline 4-stroke equipment at 2.12%, and aircraft at 1.28%, with remainder coming from other non-road sources. Off-highway diesel vehicles emitted the most PM<sub>2.5</sub> among non-road sources at 2.63%, followed by off-highway gasoline 2-stroke equipment at 1.15% and railroad equipment at 0.99%. Finally, almost all non-road source SO<sub>2</sub> was attributable to aircraft at 5.18% of the total inventory of SO<sub>2</sub>.

Current and past federal regulations have been established to cover nearly all of the above sources as shown in the table below.

**Table 1 -- Federal Non-road Regulations**

<b>Engine category</b>	<b>Type/Fuel</b>	<b>CFR Cite for regulations establishing emission standards</b>	<b>Rulemakings (categories and subcategories)</b>	<b>Final Rulemaking</b>	<b>FR Date</b>
Locomotive engines	Diesel	40 CFR Part 92 and 1033	Locomotives	63 FR 18978	April 16, 1998
Locomotive engines	Diesel	40 CFR Part 92 and 1033	Locomotives and commercial marine diesel < 30 liters per cylinder	73 FR 37096	June 30, 2008
Marine diesel engines	Diesel	40 CFR Part 94 and 1042	Commercial marine diesel < 30 liters per cylinder	64 FR 73300	December 29, 1999
Marine diesel engines	Diesel	40 CFR Part 94 and 1042	Recreational vehicles, Industrial spark-ignition engines > 19 kW, and Recreational marine diesel	67 FR 68242	November 8, 2002

Marine diesel engines	Diesel	40 CFR Part 94 and 1042	Marine diesel engines $\geq$ 2.5 liters/cylinder	68 FR 9746	February 28, 2003
Marine diesel engines	Diesel	40 CFR Part 94 and 1042	Locomotives and commercial marine diesel < 30 liters per cylinder	73 FR 37096	June 30, 2008
Marine diesel engines	Diesel	40 CFR Part 1043	New marine compression-ignition engines $\geq$ 30 liters per cylinder	75 FR 22896	April 30, 2010
Other nonroad diesel engines	Diesel	40 CFR Parts 89 and 1039	Land-based diesel engines $\geq$ 37 kW -- Tier 1	56 FR 31306	June 17, 1994
Other nonroad diesel engines	Diesel	40 CFR Parts 89 and 1039	Land-based diesel engines -- Tier 1 and Tier 2 for engines < 37 kW -- Tier 2 and Tier 3 for engines $\geq$ 37 kW	63 FR 56968	October 23, 1998
Other nonroad diesel engines	Diesel	40 CFR Parts 89 and 1039	Land-based diesel engines -- Tier 4	69 FR 38958	June 29, 2004
Marine SI engines	SI	40 CFR Part 91	Marine SI engines -- outboard and personal watercraft	61 FR 52088	October 4, 1996
Sterndrive and inboard marine engines	SI	40 CFR Part 1045	Emissions from nonroad spark-ignition engines and equipment	73 FR 59034	October 8, 2008
Outboard and personal watercraft engines	SI	40 CFR Part 1045	Emissions from nonroad spark-ignition engines and equipment	73 FR 59034	October 8, 2008
Recreational vehicles	SI and diesel	40 CFR Part 1051	Recreational vehicles, Industrial spark-ignition engines > 19 kW, and Recreational marine diesel	67 FR 68242	November 8, 2002
Small SI engines	SI	40 CFR Part 90	Small SI engines -- Phase 1	60 FR 34581	July 3, 1995
Small SI engines	SI	40 CFR Part 90	Small SI engines (Nonhandheld) -- Phase 2	64 FR 15208	March 30, 1999
Small SI engines	SI	40 CFR Part 90	Small SI engines (Handheld) -- Phase 2	65 FR 24268	April 25, 2000
Small SI engines -- Phase 3 (Handheld and nonhandheld)	SI	40 CFR Part 1054	Emissions from nonroad spark-ignition engines and equipment	73 FR 59034	October 8, 2008

Large SI engines	SI and diesel	40 CFR Part 1048	Recreational vehicles, Industrial spark-ignition engines > 19 kW, and Recreational marine diesel	67 FR 68242	November 8, 2002
Aircraft emission standards	Aircraft	40 CFR Part 87	Aircraft and Aircraft Engines	62 FR 25356	May 8, 1997
Aircraft emission standards	Aircraft	40 CFR Part 87	Aircraft and Aircraft Engines	70 FR 69664	November 17, 2005
Aircraft emission standards	Aircraft	40 CFR Part 87 and 1068	Aircraft and Aircraft Engines	77 FR 36342	June 18, 2012

Anticipated emissions reductions from non-road mobile federal regulations are sizable. For example, the latest generation of off-highway diesel vehicle regulations (Tier 4 standards) reduces emissions of NO<sub>x</sub> by 21-96% and PM by 50-96% depending on engine power rating when compared to Tier 1 standards. Similarly, the Tier 4 locomotive standards reduce HC by 86.0-93.3%, NO<sub>x</sub> by 86.3-89.0%, and PM by 86.4-88.5% depending on locomotive duty-cycle (i.e., line-haul vs. switch). Small, spark-ignition engines – which are the predominant source of 2- and 4-stroke off-highway gasoline vehicle emissions – likewise see reductions of 37.9-79.0% of HC+NO<sub>x</sub> emissions between regulatory Phases 2 and 3 depending upon equipment class rating. Finally, additional NO<sub>x</sub> reductions are anticipated from recent aircraft engine regulations. Taken as a whole, UDAQ anticipates federal non-road mobile emissions regulations will continue to result in dramatic reductions in non-road mobile source emissions in the Salt Lake Nonattainment Area as old equipment is replaced over time.