

the proposed special permit/selection of the Proposed Action Alternative could result in ETS shipping smaller quantities of LNG over the highway in cargo tank motor vehicles and greater quantities of LNG via rail, which would result in less fuel use and less emissions. Moving one ton of freight by train would result in approximately 70% less fuel than moving the same freight by motor vehicle.

## Engine Emissions

As shown with the fuel efficiency, trains can transport freight on approximately 30% of the fuel needed for a motor vehicle to transport an equivalent amount. Diesel engines produce a variety of regulated emissions, including: volatile organic compounds (VOC), carbon monoxide (CO), nitrogen oxides (NO<sub>x</sub>), particulate matter less than 10 microns in diameter (PM<sub>10</sub>), and sulfur oxides (SO<sub>x</sub>). These emissions directly affect air quality which can cause negative health effects such as respiratory and cardiovascular complications.<sup>15</sup> A standardized comparison of the emissions of substances produced from rail and truck transportation methods was calculated by the United States Department of Transportation in their Freight Routing and Emissions Analysis Tool (FREAT).<sup>16</sup> A standardized unit, g/TEU-mi, converted the grams of pollutant produced per twenty-foot equivalent unit (TEU) per mile. A TEU is a commonly defined container unit for shipping cargo with volume of 20' length x 8'6" height x 8' width. The results of the standardized comparison of grams of pollutants produced per TEU per mile for transportation by truck, rail, and ship are shown below in Table 1.

Table 1. Summary of Emission Factors (g/TEU-mi).<sup>16</sup>

Mode	Pollutant				
	VOC	CO	NO <sub>x</sub>	PM <sub>10</sub>	SO <sub>x</sub>
Truck	0.34	1.64	6.86	0.12	0.22
Rail	0.14	0.39	2.81	0.07	0.03
Ship	0.30	1.37	7.93	0.23	3.91

Transporting cargo by train results in significant decreases in emissions. Transport by rail substantially decreases the pollutant emissions by a minimum of 1.7 times the particulate matter (PM<sub>10</sub>) which has direct effects on the quality of air. All other pollutants are within the 1.7 to 7.3x ranges resulting in a significant decrease in pollutants when transporting cargo by rail over truck.

<sup>15</sup> Accessed via <https://www.epa.gov/particle-pollution-and-your-patients-health/course-outlinekey-points-on-february-26>, 2019.

<sup>16</sup> Accessed via [https://cms.dot.gov/sites/dot.gov/files/docs/emissions\\_analysis\\_of\\_freight.pdf](https://cms.dot.gov/sites/dot.gov/files/docs/emissions_analysis_of_freight.pdf) on February 25, 2019.