

TECHNICAL SUPPORT DOCUMENT
2017 BASELINE WINTERTIME OZONE EMISSIONS INVENTORY:
OFF-ROAD MOBILE SOURCES
OPERATING WITHIN THE OIL AND GAS FIELDS
LOCATED IN THE UINTAH, UT NONATTAINMENT AREA

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Utah Division of Air Quality
Planning Branch/Mobile Sources

Abstract

This report discusses the 2017 baseline wintertime ozone emissions inventory for off-road mobile sources that operate within the oil and gas fields located in the Uintah, UT Non-Attainment Area (NA).

Off-road mobile inventories were calculated using emission factors generated by the EPA MOVES2014b (Motor Vehicle Emission Simulator) utilizing the movesdb20181022 default database. Off-road vehicle activity per well type of activity was provided a 2011 Environ Study Table 3 Weighted average on-road traffic data¹(see Table 1). Production activity by product type calculation was provided by Western Energy Alliance (Alliance) and the Utah Petroleum Association (UPA). 2017 production activity and active well counts were provided for by the DAQ Technical Analysis Section from the Utah Division of Oil, Gas, and Mining.

Agencies that developed the 2017 baseline off-road mobile source inventory:

Uintah Basin, UT Ozone NA:

Utah Division of Air Quality (UDAQ) and the Utah Department of Transportation (UDOT)

Summary Table for the 2017 baseline wintertime ozone emissions inventory for oil and gas off-road mobile sources are located on page 15-16.

3.) OFF-ROAD MOBILE SOURCES INVENTORIES

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ii. Glossary of Acronyms:

Alternative Vehicle and Fuels & Technology: (AVFT)

Barrels (bbl)

County Data Manager: (CDM)

MOVES2014b: (Motor Vehicle Emission Simulator)

Nonattainment Area: (NA)

Utah Division of Air Quality (UDAQ)

Utah Department of Transportation: (UDOT)

Utah Petroleum Association (UPA)

Vehicle Hours Traveled: (VHT)

Vehicle Miles Traveled: (VMT)

Western Energy Alliance: (Alliance)

iii. Overview

The purpose of this document is to explain the emissions modeling assumptions used to develop the 2017 baseline wintertime ozone emissions inventory for off-road mobile sources that operate within the oil and gas fields located in the Uintah, UT Non-Attainment Area (NA).

Agencies that developed the 2017 baseline for the Uintah Basin, UT Ozone NA:

Utah Division of Air Quality (UDAQ) and the Utah Department of Transportation (UDOT)

iv. Emissions Factors

The following procedures were used to develop emission factors for the off-road mobile source operating within the oil and gas fields

1. Emission Factor Development

Emission factors were developed utilizing the EPA approved MOVES2014b (Motor Vehicle Emission Simulator) model with the following default database: movesdb20181022. The inventory mode was used to create two types of emission factor estimates. The first emission factor estimate involves creating a generic rate from all of the emissions processes and vehicle miles travel (VMT) output based on speeds from the 2011 Environ Study Table 3 Weighted average on-road traffic data¹ (see Table 1). The second emission factor from the inventory mode involves utilizing the project mode and creating an idle emission factor.

Document research was conducted and identified a different activity method being used by the Colorado Air Resource Management² and Bureau of Land Management Utah Air Program³ for areas similar to the Uintah Basin. The vehicle activities listed by both agencies are identical to each other but are not referenced as to how they were created, the types of roads that are covered, and where those roads are located (within and/or outside the oil field). These studies do not include average speed for each identified activity and do not include idle emissions. The 2011 Environ study activity data was selected because it includes references and provides more specific activity data.

2. Generic Rate

The inventory mode was used within MOVES to produce a generic emissions rate for off-road vehicles. The inventory mode provides emissions estimates in tons per average weekday and are divided by VMT to produce a generic rate for off-road vehicles in grams per mile of activity. The emissions processes used to create the rate include starts, exhaust, evaporative, and hotsoak emissions. This method is more conservative than the rates mode because it contains more emissions detail. The 2011 Environ Study Table 3 Weighted average on-road traffic data identified the following off-road mobile sources that operate within the oil and gas fields: gasoline and diesel light duty commercial trucks and diesel combination short haul trucks. MOVES was setup to produce output based on these vehicle types.

Similar inputs from the 2017 Baseline on-road mobile inventory were used to create the generic rate for off-road vehicle inventory except for the speed profiles. The shared inputs include vehicle fuel profiles and specifications, VMT, VMT mix, vehicle age distributions, and meteorological conditions. The logic in this modeling setup is that the vehicles operating on-road within the non-attainment area have the same vehicle characteristics as those operating off-road within oil and gas fields within the non-attainment area. Without any vehicle characteristic data for off-road vehicles operating within the oil and gas fields, this is the best assumption that can be made. In addition to the inputs mentioned above, the only input profile that changed from the on-road input is the average speed activity input. The speed activity data for the off-road mobile inventory was provided by the 2011 Environ Study Table 3 Weighted average on-road traffic data (Table 1).

3. Idle Rate

The inventory mode was also used to construct emission factors for idling emissions. Idle emission factors are obtained from MOVES using the same vehicle characteristics and speed profiles used to create the generic emission rates. When MOVES is run under a project level inventory, it will provide idle emission factors. The 2011 Environ Study Table 3 Weighted average on-road traffic data (Table 1) provides idle hours per well activity by vehicle type to coincide with the idle emission factors from MOVES.

v. MOVES Modeling Procedure

1. MOVES Default Database

EPA MOVES2014b: movesdb20181022

2. MOVES2014 Daily Pollutants

- Ammonia (NH₃)
- Carbon Monoxide (CO)
- Oxides of Nitrogen (NO_x)
- PM^{2.5} Exhaust (PM_{25_Ex})
- Volatile Organic Compounds (VOC)

3. MOVES2014 Local Model Inputs for Emission Factors

(a) County Data Manager Development

MOVES organizes data inputs into databases called County Data Manager (CDM) tables. CDMs were developed for Duchesne and Uintah counties for the 2017 baseline wintertime ozone emissions inventory for off-road mobile sources.

(1) Average Speed Distribution

Speed data provided by the 2011 Environ Study¹ Table 3 was used to calculate a weighted 24 hour average speed for rural unrestricted access roads. The dirt roads within the oil and gas fields within the basin experience very little traffic and delay so a 24 hour speed profile replicates that activity. The weighted speeds calculations were based on the fraction of VMT per well traffic activity defined by vehicle type. This calculation resulted in separate speed profiles for light commercial trucks and combination short haul trucks.

(2) AVFT (Alternative Vehicle and Fuels & Technology: Electric, Diesel and Gasoline Vehicle Fractions)

The MOVES default file for AVFT was updated with 2018 State DMV registration data (dated January 1, 2018). The DMV fuel split data is for all model years for registered light duty vehicles (passenger cars and light duty trucks) and is not available for model year. The DMV fuel data is adjusted to match the DMV age distribution data.

<u>DMV data</u>	<u>AVFT Model Years</u>
2018	2050-2017
2017	2016
2016	2015
2015	2014-1960

MOVES2014b default AVFT values were used for all remaining source type vehicles.

(3) Fuel

An adjustment was made for 2017 to account for gasoline sulfur level in Utah since small volume refiners are not required to comply with federal Tier 3 gasoline (10 ppm sulfur) requirements until January 1, 2020. EPA Office of Transportation and Air Quality (OTAQ) provided 2017 local gasoline sulfur values of 20.9 ppm. MOVES 2014a default fuel parameters were used for diesel and CNG.

(4) HourVMTFraction

MOVES2014b default Hour VMT Fraction values were used.

(5) HPMSvTypeYear (VMT)

UDOT State Travel Demand Model provided VMT inputs for MOVES. The State TDM analyzed thousands of separate traffic segments called "links" that together comprise the network of roads of Duchesne and Uintah County. Each

link is assigned, for each of the four major time periods during the day (AM peak, midday, PM peak and nighttime), an average speed, an increment of VMT and an increment of VHT (vehicle hours traveled). A specific number of links are assigned to each of the UDOT HPMS functional classes (road types, e.g., rural local, urban local, rural minor arterial, urban minor arterial, and so on). In effect, average speeds, VMT and VHT for each of the functional classes are combined to obtain average speed, VMT and VHT for rural arterials, urban arterials, rural local roads and urban local roads. Seasonal factors for highway VMT variations have been revised and refined by UDAQ with data supplied by the UDOT. Seasonal factors are determined by functional class (freeway or arterial) for each county.

(6) Road Type Distribution

UDOT Division of Systems Planning and Programming provided 2017 VMT travel fractions for FHWA vehicle classes grouped by Gross Vehicle Weight Rating (GVWR) ranges. The travel fractions were obtained by county from automated pneumatic counters that detect axle spacing and "weigh-in motion" (WIM) counters placed on arterial, interstate, and local roads. VMT and Vehicle Mix data were used to construct road type distribution and VMT by sourcetype.

(7) Source Type Age Distribution & Source Type Year

The 2017 vehicle age distribution data and source type vehicle population for vehicle types 11, 21, 31, and 32 (motorcycles, passenger cars, passenger trucks, and light duty commercial trucks up to 10,000 GVWR) was based on 2018 Utah DMV registration data (dated January 1, 2018). The first model year of 2018 vehicle counts were removed and the first model year used is 2017 through 1969. This count provides a conservative snapshot of the vehicle fleet where it ensures that all of the 2017 model years sold are included and removes a small fraction of the 2018 model year. The MOVES default vehicle fraction count data for passenger cars, passenger trucks, and light duty commercial trucks was used to determine the vehicle population for these vehicles since the DMV data cannot discern between a passenger car (21) and light duty trucks (31,32). MOVES default age distribution and vehicle population counts are used for the remaining heavy duty vehicle types because the state DMV data is incomplete, does not match MOVES vehicle types, or does not cover all the heavy duty vehicle types that are registered in other states traveling within the state of Utah.

(8) ZoneMonthHour (Meteorological Data)

The UDAQ Technical Analysis Section provided metrological conditions from the airport in Vernal, Utah from the MesoWest archives. Mesowest (mesowest.utah.edu) is a database of current and archived meteorological data from weather stations in the United States maintained by the University of Utah. The meteorological data is an hourly average temperature and relative humidity

from an ozone exceedance event that occurred in the Uintah, UT Non-attainment area from February 1-10, 2013.

vi. Emissions Calculations:

Generic and idle emission factors were initially created separately for Duchesne and Uintah counties. To create an aggregate generic and idle emission factor the VMT from the on-road inventory was used to create a weighted average emission factor that would cover all of the off-road activity occurring within the oil and gas fields. (See Table 2 & 3) This method provides a generic and idle emission factor to be multiplied by their respective oil and gas off-road mobile activity that occurs per well type of activity. VMT and idle activities are provided by The 2011 Environ Study Table 3 Weighted average on-road traffic data (See Table1).

Production traffic trips and idle time activities for Heavy Duty Diesel Trucks have been replaced according to the 2020 Alliance memo⁴. The new factors rely upon local data and are more accurate than what is provided in the 2011 Environ study. The new trip activity is based on the product produced (oil, water, condensate) and divided by the production truck load out volume (280 barrels (bbl) per oil truck, 130 bbl per water/condensate truck). The production numbers are for 2017 from the Utah Division of Oil and Gas, and Mining and includes annual water, condensate and oil (See Table 4). Produced water may be removed from the production site via truck loading, through pipelines, or evaporated or injected directly on site. Produced water in this calculation assumes that all produced water is loaded onto a truck and disposed of off site. This assumption is conservative resulting in an overestimation of truck loading for produced water in volume in 2017. The produced product is divided by the number of active wells to produce annual trips per well type (See Table 5). Average Idle time was assigned according to how long it takes to fill a truck: oil trucks takes 60 minutes and condensate or water truck takes 45 minutes. The new production traffic round trips per activity for Heavy Duty Trucks has been updated from 3 trips to 68 trips per year. The idle activity per trip has been updated from 0.3 hours to 0.97 hours.

VMT is based on oil and gas round trip distances and round trips per activity. Idle hours is based on engine-on idle time per trip and round trips per activity. All of the activities used occur within the oil and gas field. Off-road mobile activities (trips and idle hours) are split into the following categories for a single well: well pad construction, pipeline activity, drilling, completion, recompletions, production traffic, maintenance, ancillary, and employee commuter. The emissions for a single well are summed to create an annual emissions inventory. The annual emissions from a single well is multiplied by the total number of active wells to produce an annual emissions inventory. The 2017 active well counts are provided at the county level. The DAQ Technical Analysis section provided the county well count data from the Utah Division of Oil, Gas, and Mining. The resulting off-road mobile emissions inventories can be found in Table 6 for Duchesne County and Table 7 for Uintah County.

1. Environ Oil and Gas Mobile Sources Pilot Study; Prepared for: U.S. Environmental Protection Agency Work Assignment 4-08. July 2011 Table 3 Weighted average on-road traffic data

Table 3. Weighted average on-road traffic data.

Activity	Vehicle Type	Fuel Type	Total Round Trip Distance (miles/trip)	Total Engine-on Idle Time per Trip (hours/trip)	Within-Field Round Trip Distance per Visit per Facility (miles/trip)	Within Field Engine-on Idle Time per Trip (hours/trip)	Within-Field Percentage of Mileage on Unpaved Roads (%)	Within-Field Percentage of Mileage on Paved Roads (%)	Within-Field Mean Vehicle Speed (mph), Paved Road	Within-Field Mean Vehicle Speed (mph), Unpaved Road	Round Trips per Activity	
Drilling Traffic												
Drilling events	HDDT	Diesel	23.1	0.7	6.6	0.7	71.6	28.4	16.9	16.4	115.1	
	LDT	Diesel	71.5	1.4	6.7	0.3	69.2	30.8	17.1	16.6	38.1	
	LDT	Gasoline	96.8	1.7	7.5	0.5	62.2	37.8	24.2	15.8	30.0	
Completion Traffic												
Completions	HDDT	Diesel	40.2	1.1	8.7	0.7	69.2	30.8	17.1	16.6	148.6	
	LDT	Diesel	100.0	2.0	10.0	0.5	55.0	45.0	25.0	15.0	27.3	
	LDT	Gasoline	100.0	2.0	10.0	0.5	55.0	45.0	25.0	15.0	13.7	
Recompletion Traffic												
Recompletions	HDDT	Diesel	10.0	0.0	8.0	0.0	50.0	50.0	20.0	20.0	7.0	
	LDT	Diesel	-	-	-	-	-	-	-	-	-	
	LDT	Gasoline	8.0	0.0	8.0	0.0	50.0	50.0	20.0	20.0	4.0	
Production Traffic												
Total Well Count	HDDT	Diesel	37.8	0.9	8.2	0.3	75.6	24.4	25.0	17.3	3.3	
	LDT	Diesel	100.0	2.5	10.0	0.5	55.0	45.0	25.0	15.0	2.8	
	LDT	Gasoline	100.0	2.5	10.0	0.5	55.0	45.0	25.0	15.0	2.8	
Employee Commuter												
Well Pad Construction	HDDT	Diesel	-	-	-	-	-	-	-	-	-	
	LDT	Diesel	125.0	2.5	10.0	0.5	55.0	45.0	25.0	15.0	17.9	
	LDT	Gasoline	113.9	1.8	8.9	0.4	67.9	32.1	17.9	16.4	51.7	
Pipeline Construction	HDDT	Diesel	-	-	-	-	-	-	-	-	-	
	LDT	Diesel	150.0	2.5	10.0	0.5	55.0	45.0	25.0	15.0	7.1	
	LDT	Gasoline	131.7	1.8	8.9	0.4	67.9	32.1	17.9	16.4	17.7	
Drilling	HDDT	Diesel	-	-	-	-	-	-	-	-	-	
	LDT	Diesel	125.0	2.5	10.0	0.5	55.0	45.0	25.0	15.0	13.7	
	LDT	Gasoline	112.7	1.7	8.7	0.3	69.2	30.8	17.1	16.6	52.3	
Completion	HDDT	Diesel	-	-	-	-	-	-	-	-	-	
	LDT	Diesel	125.0	2.5	10.0	0.5	55.0	45.0	25.0	15.0	17.1	
	LDT	Gasoline	112.7	1.7	8.7	0.3	69.2	30.8	17.1	16.6	69.6	
Recompletion	HDDT	Diesel	-	-	-	-	-	-	-	-	-	
	LDT	Diesel	125.0	2.5	10.0	0.5	55.0	45.0	25.0	15.0	2.0	
	LDT	Gasoline	125.0	2.5	10.0	0.5	55.0	45.0	25.0	15.0	4.0	

Activity	Vehicle Type	Fuel Type	Total Round Trip Distance (miles/trip)	Total Engine-on Idle Time per Trip (hours/trip)	Within-Field Round Trip Distance per Visit per Facility (miles/trip)	Within Field Engine-on Idle Time per Trip (hours/trip)	Within-Field Percentage of Mileage on Unpaved Roads (%)	Within-Field Percentage of Mileage on Paved Roads (%)	Within-Field Mean Vehicle Speed (mph), Paved Road	Within-Field Mean Vehicle Speed (mph), Unpaved Road	Round Trips per Activity
Total Well Count	HDDT	Diesel	-	-	-	-	-	-	-	-	-
	LDT	Diesel	100.0	2.5	15.0	0.5	55.0	45.0	25.0	15.0	18.1
	LDT	Gasoline	100.0	2.5	15.0	0.5	55.0	45.0	25.0	15.0	40.2
Pipeline											
Well Pad Constructed	HDDT	Diesel	13.6	0.4	7.1	0.2	64.3	35.7	17.9	16.4	2.0
	LDT	Diesel	100.0	2.0	10.0	0.5	50.0	50.0	25.0	15.0	2.1
	LDT	Gasoline	100.0	2.0	10.0	0.5	50.0	50.0	25.0	15.0	2.1
Maintenance											
Total Well Count	HDDT	Diesel	100.0	3.0	10.0	0.5	55.0	45.0	25.0	15.0	0.9
	LDT	Diesel	100.0	2.0	10.0	0.3	55.0	45.0	25.0	15.0	0.4
	LDT	Gasoline	100.0	2.0	10.0	0.3	55.0	45.0	25.0	15.0	0.4
Ancillary											
Total Well Count	HDDT	Diesel	-	-	-	-	-	-	-	-	-
	LDT	Diesel	-	-	-	-	-	-	-	-	-
	LDT	Gasoline	135.5	3.1	10.0	0.5	55.0	45.0	25.0	15.0	3.9
Construction											
Well Pad Construction	HDDT	Diesel	13.57	0.40	7.07	0.23	64.29	35.71	17.86	16.43	22.86
	LDT	Diesel	100.00	2.00	10.00	0.50	50.00	50.00	25.00	15.00	6.43
	LDT	Gasoline	100.00	2.00	10.00	0.50	50.00	50.00	25.00	15.00	6.43

Table 2 MOVES Generic Emission Factors

2017 February MOVES Emissions in Grams										MOVES Generic VMT Weighted Emission Factors				
yearid	countyid	sourcetypeid	fueltypeid	CO	NOx	VOC	NH3	PM25_ex	vmt	CO	NOx	VOC	NH3	PM25_ex
2017	49013	32	1	610,580	53,421	51,383	1,647	2,390	43,754					
2017	49047	32	1	753,402	62,353	65,783	1,823	2,898	49,568					
				1,363,982	115,774	117,166	3,470	5,288	93,322	14.62	1.24	1.26	0.04	0.06
2017	49013	32	2	82,313	40,358	12,400	293	2,069	12,862					
2017	49047	32	2	82,184	39,566	12,913	288	1,960	12,679					
				164,497	79,924	25,313	581	4,029	25,541	6.44	3.13	0.99	0.02	0.16
2017	49013	61	2	58,347	204,216	12,911	704	9,870	23,601					
2017	49047	61	2	73,253	254,644	16,216	877	12,309	29,429					
				131,600	458,860	29,127	1,581	22,179	53,030	2.48	8.65	0.55	0.03	0.42

Road Type 1 and 3 were used for the inventory

Road Type 3 run for 24 hour speed from Speeds tab

Table 3 MOVES Weighted Idle Emission Factors

2017 February Weighted Idle Emission Factors			
Vehicle	Fuel	Pollutant	Idle EF
32	1	CO	28.79
32	1	NOx	1.71
32	1	VOC	2.87
32	1	NH3	0.28
32	1	PM25_ex	0.06
32	2	CO	8.78
32	2	NOx	5.22
32	2	VOC	1.49
32	2	NH3	0.05
32	2	PM25_ex	0.40
61	2	CO	23.41
61	2	NOx	93.68
61	2	VOC	10.96
61	2	NH3	0.38
61	2	PM25_ex	5.52

Table 4 2017 Annual Production

2017 Annual Production (Utah Division of Oil, Gas, and Mining)				
FIPS	Annual Water (bbls)		Annual Condensate (bbls)	Annual Oil (bbls)
	Gas Well	Oil Well	Gas Well	Oil Well
49013	189,580	39,860,215	69,197	16,917,585
49047	16,220,360	23,318,081	1,281,502	9,996,594
Total	16,409,940	63,178,296	1,350,699	26,914,179

Table 5 2017 Annual Active Wells

2017 Annual Number of Active Wells for Duchesne and Uintah Counties (Utah Division of Oil, Gas, and Mining)				
FIPS	Gas	Oil	Sum	Spuds
49013	49	2906	2,955	60
49047	5795	1640	7,435	84

Table 6 Duchesne Off-Road Inventory

Duchesne February Off-Road Mobile Sources Operating in the Oil & Gas Fields															
Well Activity	Well Type	Well Count	Veh Type	Fuel	Emissions Totals per activity in grams					Emissions Totals for all activity in grams					Annual VMT
					CO	NOx	VOC	NH3	PM25 ex	CO	NOx	VOC	NH3	PM25 ex	
Well Pad	SPUD	60	32	Gasoline	1,032	85	90	3	4	61,941	5,116	5,398	197	230	3,858
Constructed	SPUD	60	32	Diesel	442	218	69	2	11	26,540	13,080	4,111	97	686	3,858
	SPUD	60	61	Diesel	524	1,891	146	7	97	31,450	113,462	8,784	408	5,797	9,697
Well Pad	SPUD	60	32	Gasoline	337	28	29	1	1	20,229	1,671	1,763	64	75	1,260
Constructed	SPUD	60	32	Diesel	144	71	22	1	4	8,668	4,272	1,343	32	224	1,260
	SPUD	60	61	Diesel	45	160	12	1	8	2,676	9,621	731	34	489	852
Drilling	SPUD	60	32	Gasoline	3,720	305	326	13	14	223,221	18,287	19,535	752	820	13,500
	SPUD	60	32	Diesel	1,744	859	270	6	45	104,663	51,511	16,201	382	2,692	15,316
	SPUD	60	61	Diesel	3,771	14,121	1,300	53	762	226,280	847,268	78,025	3,178	45,744	45,580
Completions	SPUD	60	32	Gasoline	2,200	182	192	7	8	131,973	10,900	11,501	420	491	8,220
	SPUD	60	32	Diesel	1,878	926	291	7	49	112,683	55,535	17,453	413	2,913	16,380
	SPUD	60	61	Diesel	5,643	20,931	1,850	78	1,115	338,603	1,255,878	111,018	4,662	66,888	77,569
Recompletions	Producing	2,955	32	Gasoline	468	40	40	1	2	1,382,076	117,310	118,720	3,516	5,358	94,560
	Producing	2,955	61	Diesel	139	485	31	2	23	410,658	1,431,872	90,891	4,934	69,210	165,480
Total Well Count	Producing	2,955	32	Gasoline	450	37	39	1	2	1,328,402	109,720	115,764	4,226	4,943	82,740
	Producing	2,955	32	Diesel	193	95	30	1	5	569,194	280,525	88,162	2,084	14,716	82,740
	Producing	2,955	61	Diesel	6,489	24,383	2,278	92	1,323	19,176,437	72,050,379	6,730,916	271,305	3,908,908	3,669,215
Total Well Count	Producing	2,955	32	Gasoline	62	5	5	0	0	182,967	15,270	15,859	538	692	11,820
	Producing	2,955	32	Diesel	27	13	4	0	1	79,239	38,840	12,243	286	2,007	11,820
	Producing	2,955	61	Diesel	33	120	10	0	6	97,128	354,695	29,183	1,293	18,462	26,595
Total Well	Producing	2,955	32	Gasoline	626	52	55	2	2	1,850,275	152,824	161,243	5,886	6,884	115,245
Well Pad Construction	SPUD	60	32	Gasoline	7,320	606	637	23	27	439,229	36,371	38,226	1,371	1,641	27,608
	SPUD	60	32	Diesel	1,231	607	191	5	32	73,884	36,413	11,444	271	1,910	10,740
Pipeline Construction	SPUD	60	32	Gasoline	2,506	208	218	8	9	150,374	12,452	13,087	469	562	9,452
	SPUD	60	32	Diesel	488	241	76	2	13	29,306	14,443	4,539	107	758	4,260
Drilling	SPUD	60	32	Gasoline	7,102	591	616	21	27	426,121	35,478	36,980	1,277	1,605	27,301
	SPUD	60	32	Diesel	942	464	146	3	24	56,548	27,869	8,759	207	1,462	8,220
Completion	SPUD	60	32	Gasoline	2,647	221	229	8	10	158,819	13,255	13,766	467	600	10,260
	SPUD	60	32	Diesel	4,205	2,077	652	15	110	252,316	124,597	39,116	928	6,571	36,331
Recompletion	Producing	2,955	32	Gasoline	642	53	56	2	2	1,897,718	156,742	165,378	6,037	7,061	118,200
	Producing	2,955	32	Diesel	138	68	21	1	4	406,567	200,375	62,973	1,489	10,512	59,100
Total Well Count	Producing	2,955	32	Gasoline	9,392	782	815	28	35	27,753,231	2,312,113	2,407,756	82,758	104,617	1,781,865
	Producing	2,955	32	Diesel	1,828	897	283	7	46	5,401,800	2,650,240	834,942	19,555	137,317	802,283
Tons Per Day										0.1915	0.2493	0.0341	0.0013	0.0134	20,146

Table 7 Uintah Off-Road Inventory

Uintah February Off-Road Mobile Sources Operating in the Oil & Gas Fields															
Well Activity	Well Type	Well Count	Veh Type	Fuel	Emissions Totals per activity in grams					Emissions Totals for all activity in grams					Annual VMT
					CO	NOx	VOC	NH3	PM25	ex	CO	NOx	VOC	NH3	
Well Pad	SPUD	86	32	Gasoline	1,032	85	90	3	4	88,782	7,333	7,737	282	330	5,530
Constructed	SPUD	86	32	Diesel	442	218	69	2	11	38,041	18,748	5,892	139	984	5,530
	SPUD	86	61	Diesel	524	1,891	146	7	97	45,078	162,629	12,591	585	8,309	13,899
Well Pad	SPUD	86	32	Gasoline	337	28	29	1	1	28,996	2,395	2,527	92	108	1,806
Constructed	SPUD	86	32	Diesel	144	71	22	1	4	12,424	6,123	1,924	45	321	1,806
	SPUD	86	61	Diesel	45	160	12	1	8	3,836	13,789	1,048	49	701	1,221
Drilling	SPUD	86	32	Gasoline	3,720	305	326	13	14	319,950	26,211	28,000	1,078	1,176	19,350
	SPUD	86	32	Diesel	1,744	859	270	6	45	150,016	73,832	23,221	547	3,859	21,953
	SPUD	86	61	Diesel	3,771	14,121	1,300	53	762	324,334	1,214,417	111,836	4,556	65,566	65,331
Completions	SPUD	86	32	Gasoline	2,200	182	192	7	8	189,162	15,624	16,485	602	704	11,782
	SPUD	86	32	Diesel	1,878	926	291	7	49	161,512	79,601	25,016	591	4,176	23,478
	SPUD	86	61	Diesel	5,643	20,931	1,850	78	1,115	485,331	1,800,092	159,126	6,682	95,873	111,183
Recompletions	Producing	7,435	32	Gasoline	468	40	40	1	2	3,477,407	295,160	298,709	8,847	13,482	237,920
	Producing	7,435	61	Diesel	139	485	31	2	23	1,033,245	3,602,696	228,688	12,413	174,136	416,360
Total Well Count	Producing	7,435	32	Gasoline	450	37	39	1	2	3,342,359	276,063	291,272	10,633	12,436	208,180
	Producing	7,435	32	Diesel	193	95	30	1	5	1,432,134	705,822	221,821	5,243	37,028	208,180
	Producing	7,435	61	Diesel	6,489	24,383	2,278	92	1,323	48,249,344	181,284,117	16,935,486	682,624	9,835,104	9,232,018
Total Well Count	Producing	7,435	32	Gasoline	62	5	5	0	0	460,358	38,421	39,902	1,354	1,740	29,740
	Producing	7,435	32	Diesel	27	13	4	0	1	199,371	97,725	30,803	720	5,050	29,740
	Producing	7,435	61	Diesel	33	120	10	0	6	244,381	892,439	73,428	3,254	46,452	66,915
Total Well	Producing	7,435	32	Gasoline	626	52	55	2	2	4,655,429	384,516	405,700	14,810	17,321	289,965
Well Pad Construction	SPUD	86	32	Gasoline	7,320	606	637	23	27	629,562	52,132	54,791	1,966	2,352	39,571
	SPUD	86	32	Diesel	1,231	607	191	5	32	105,900	52,192	16,403	388	2,738	15,394
Pipeline Construction	SPUD	86	32	Gasoline	2,506	208	218	8	9	215,537	17,848	18,758	673	805	13,548
	SPUD	86	32	Diesel	488	241	76	2	13	42,005	20,702	6,506	154	1,086	6,106
Drilling	SPUD	86	32	Gasoline	7,102	591	616	21	27	610,773	50,852	53,005	1,830	2,300	39,131
	SPUD	86	32	Diesel	942	464	146	3	24	81,052	39,946	12,554	297	2,096	11,782
Completion	SPUD	86	32	Gasoline	2,647	221	229	8	10	227,641	18,998	19,731	669	860	14,706
	SPUD	86	32	Diesel	4,205	2,077	652	15	110	361,652	178,589	56,066	1,331	9,419	52,075
Recompletion	Producing	7,435	32	Gasoline	642	53	56	2	2	4,774,799	394,375	416,102	15,190	17,766	297,400
	Producing	7,435	32	Diesel	138	68	21	1	4	1,022,953	504,159	158,444	3,745	26,448	148,700
Total Well Count	Producing	7,435	32	Gasoline	9,392	782	815	28	35	69,829,196	5,817,447	6,058,094	208,224	263,225	4,483,305
	Producing	7,435	32	Diesel	1,828	897	283	7	46	13,591,332	6,668,201	2,100,776	49,201	345,500	2,018,603
Tons Per Day										0.4724	0.6185	0.0842	0.0031	0.0332	49,705

vii. Appendix: Baseline Year Inventories

Input files will be furnished upon request.

viii. References

1. Environ Oil and Gas Mobile Sources Pilot Study; Prepared for: U.S. Environmental Protection Agency Work Assignment 4-08. July 2011
2. March 2016 Ramboll Environ Colorado Air Resource Management Modeling Study (CARMMS) with updated Mancos Shale Modeling CARMMS 1.5 Final Report
3. https://www.blm.gov/sites/blm.gov/files/program_natural%20resources_soil%20air%20water_airut_quick%20links_OilTemplateMOABMLP.xlsx
4. April 2, 2020 Western Energy Alliance and Utah Petroleum Association Memo RE: Uintah Basin 2017 Emissions Inventory Request for Additional Information