

Table 1. Emission Factors for the Four Aerial Campaigns and Previous Estimates

campaign			surve y subse t	area (km ²)	gathering pipeline distance (km)	no. gathering pipeline emission sources	of gathering emissions (kgh ⁻¹)	pipeline emission factor (Mgyear ⁻¹ km ⁻¹)
Permian 2019	Basin	Fall full	62000	79000±8800	331	90000±55000	10.0 (+6.4/-6.2)	
		<i>no</i> ≥ 3	15000	28000±2900	158	28000±18000	8.9 (+6.1/-5.9)	
		<i>no</i> ≥ 3; <i>nd</i> > 1	15000	28000±2900	45	14000±8800	4.5 ± 2.9	
Permian Summer 2020	Basin	full	8400	17000±410	56	13000±6900	6.8 (+3.7/-3.6)	
		<i>no</i> ≥ 3	4500	8200±290	19	5500±2900	5.8 (+3.2/-3.0)	
		<i>no</i> ≥ 3; <i>nd</i> > 1	4500	8200±290	8	1500±800	1.6 (+0.9/-0.8)	
Permian Summer 2021	Basin	full	8400	18000±400	80	12000±7300	5.9±3.5	
		<i>no</i> ≥ 3	6600	16000±390	76	11000±6700	6.2 (+3.7/-3.8)	
		<i>no</i> ≥ 3; <i>nd</i> > 1	6600	16000±390	44	8600±5500	4.8 (+3.2/-3.1)	
Permian 2021	Basin	Fall full	8800	19000±400	50	5900 ± 4100	2.7 (+1.9/-1.8)	
		<i>no</i> ≥ 3	7500	16000±450	45	5600±3700	3.1 (+2.0/-2.1)	
		<i>no</i> ≥ 3; <i>nd</i> > 1	7500	16000±450	25	4900±3200	2.7±1.8	
EPA GHGI 2020(9)				710000		16000	1.9×10 ⁻¹	
Fayetteville Shale 2017(5)				4700		400	7.5×10 ⁻¹	
Utica Shale 2019(10)				73		4.1×10 ⁻²	4.9×10 ⁻³	
San Juan Basin 2019(11)				190				