

Supporting Information for: High ethylene and propylene in an area dominated by oil production

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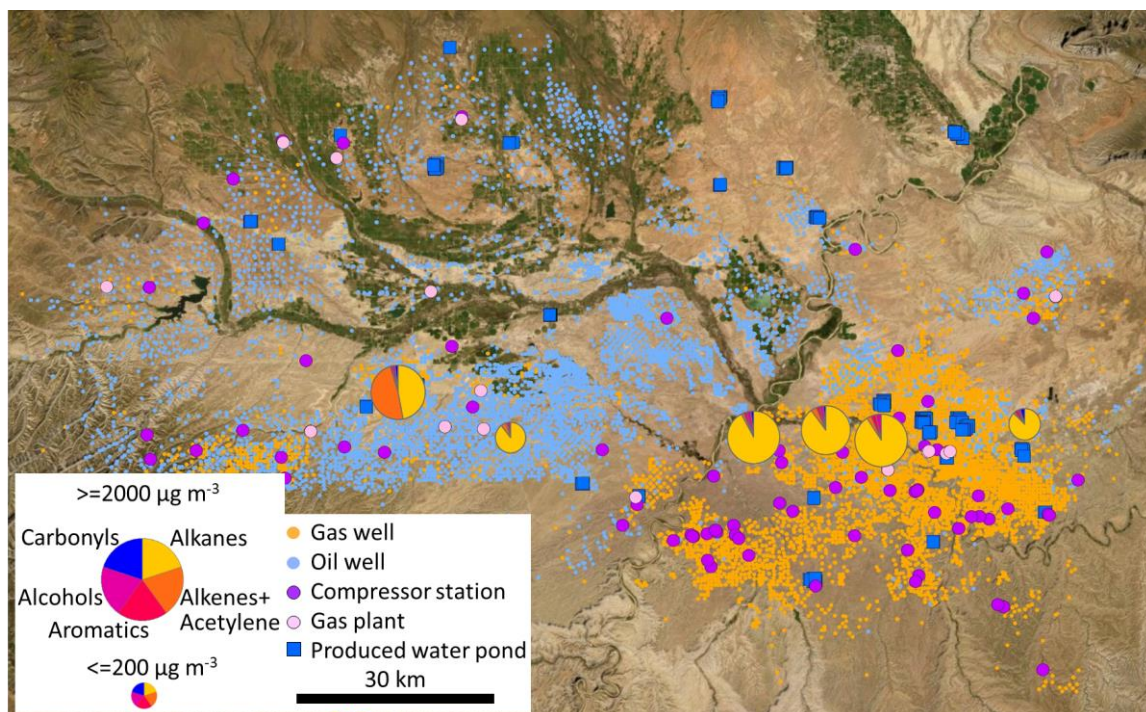


Figure S1. Composition (weight percent) and total concentration of organic compounds measured from 22:00 on 23 February 2019 to 4:00 on 24 February.

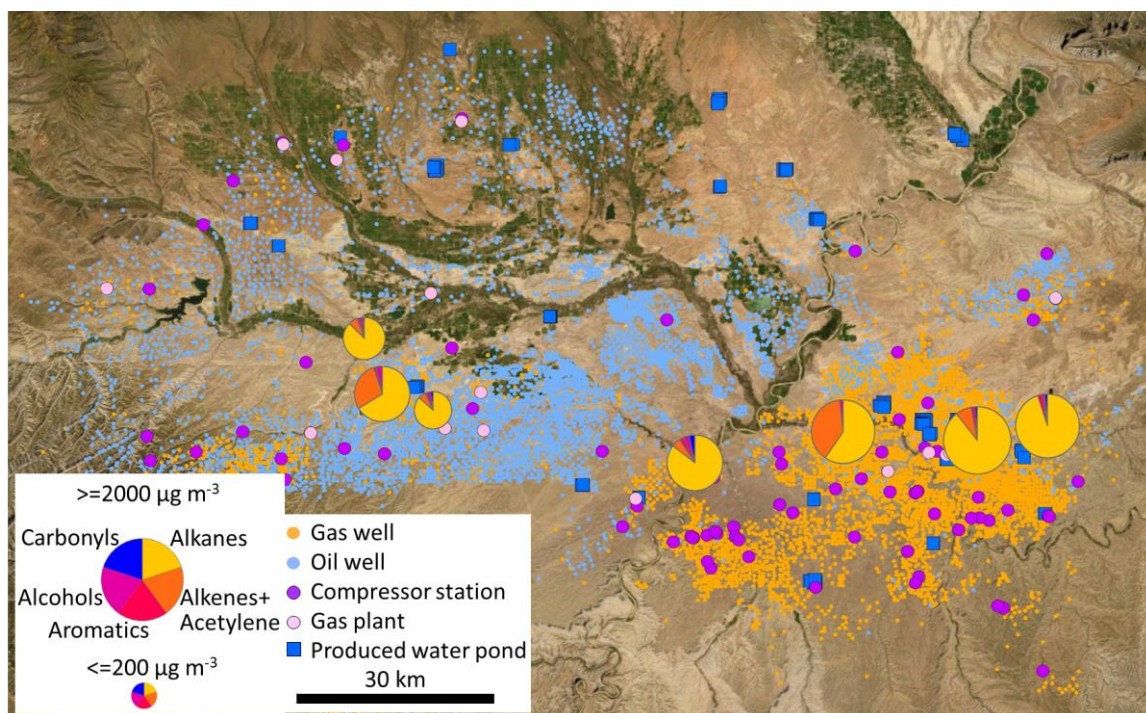


Figure S2. Composition (weight percent) and total concentration of organic compounds measured from 22:00 on 25 February 2019 to 4:00 on 26 February.

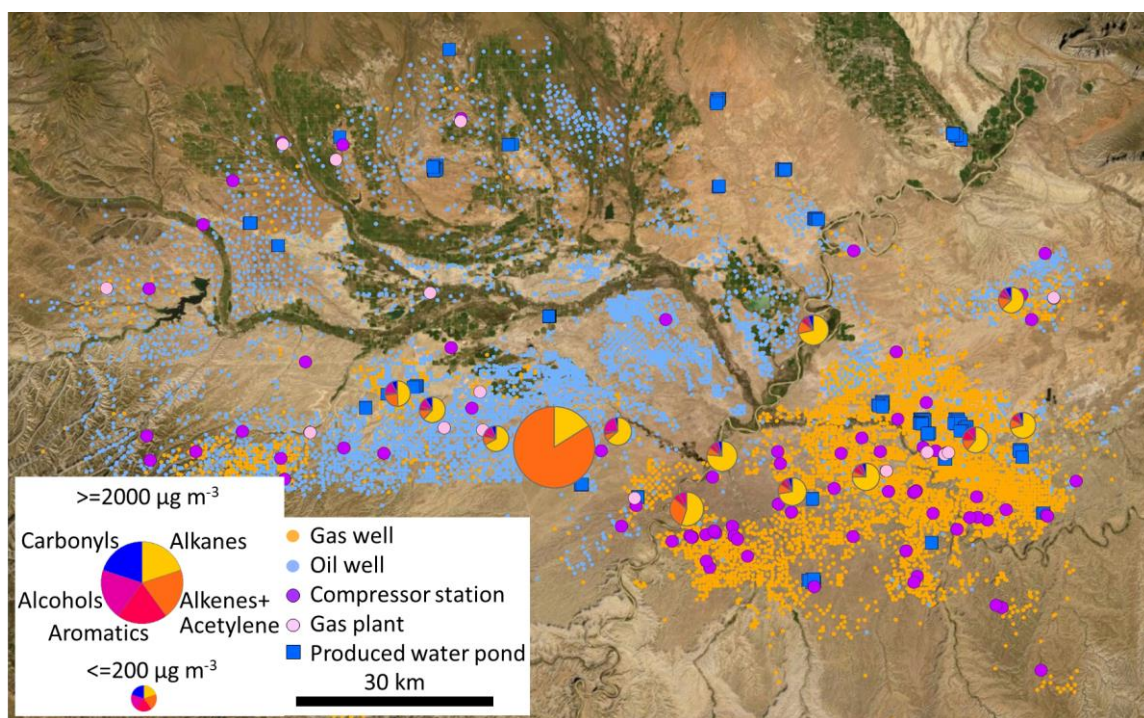


Figure S3. Composition (weight percent) and total concentration of organic compounds measured from 10:00 to 16:00 on 15 March 2019.

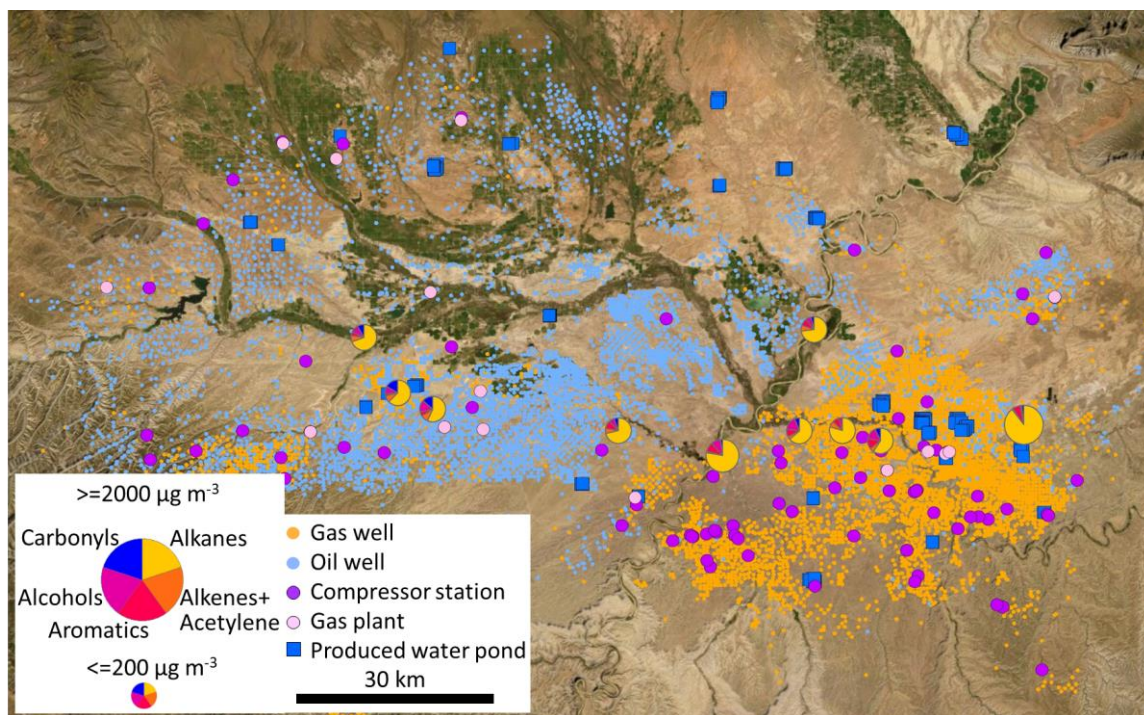


Figure S4. Composition (weight percent) and total concentration of organic compounds measured from 22:00 on 17 April 2019 to 4:00 on 18 April.

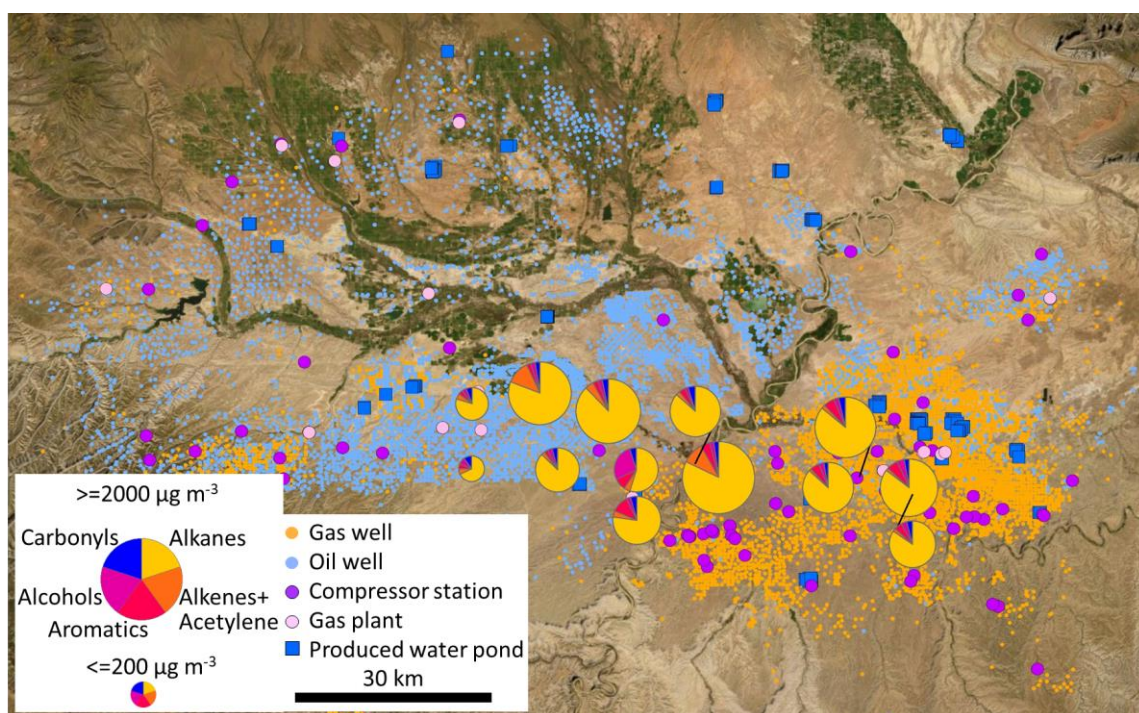


Figure S5. Composition (weight percent) and total concentration of organic compounds measured from 22:00 on 10 January 2020 to 4:00 on 11 January.

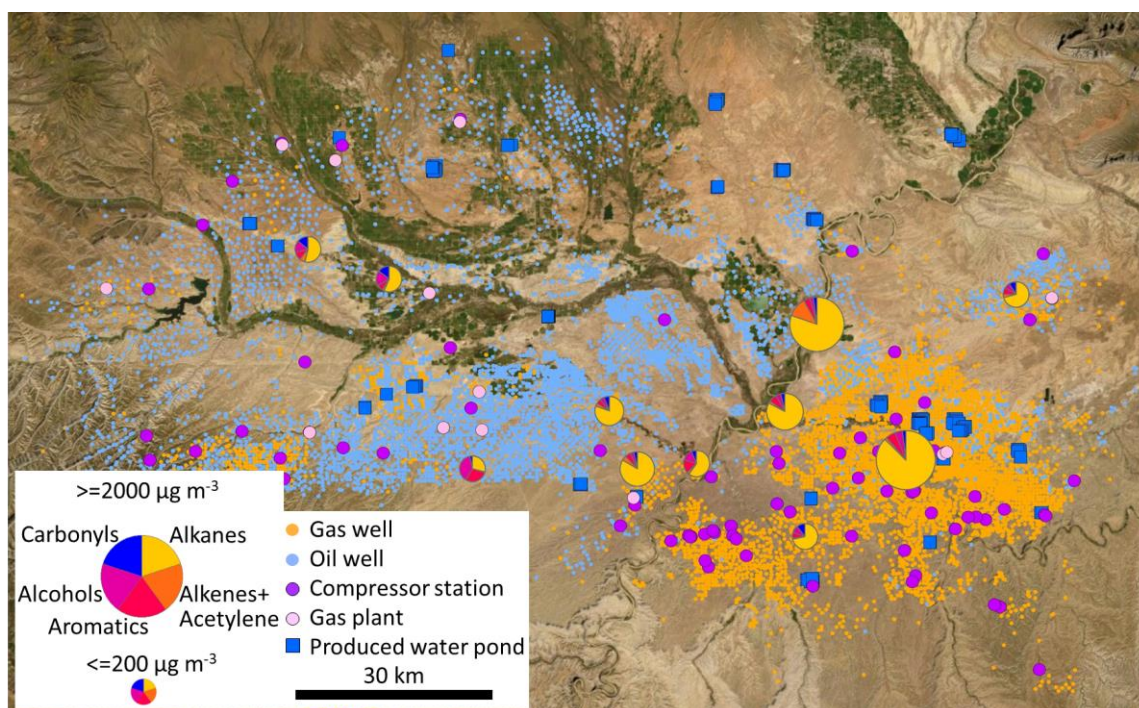


Figure S6. Composition (weight percent) and total concentration of organic compounds measured from 10:00 to 16:00 on 4 February 2020.

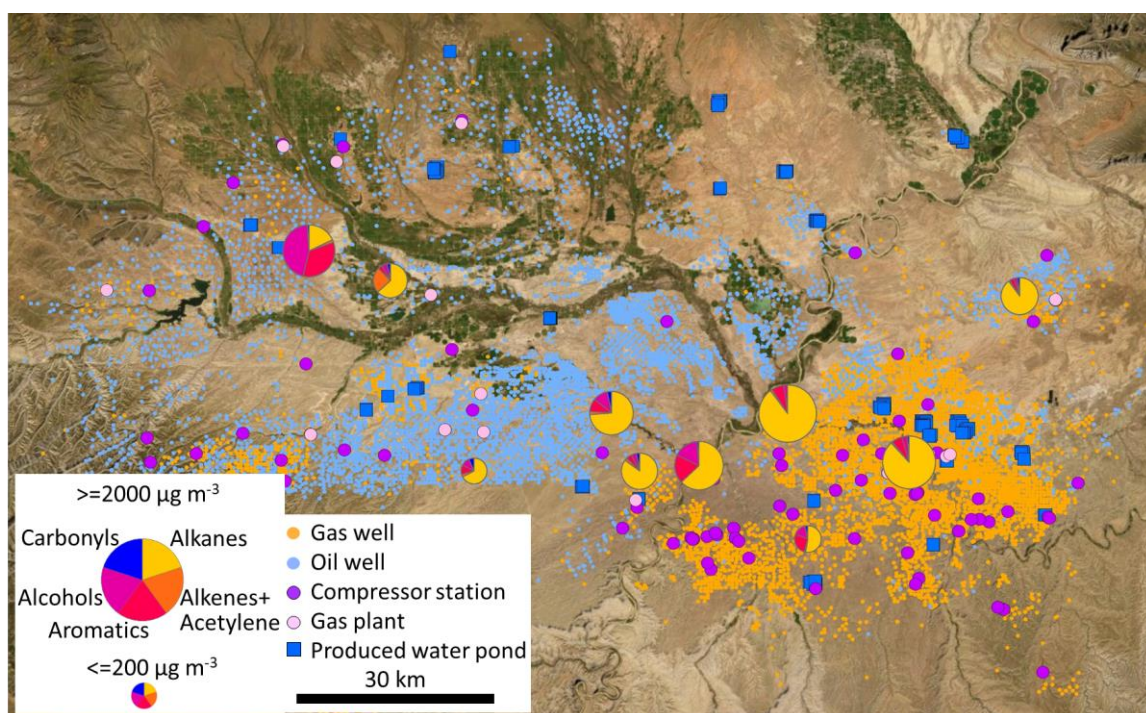


Figure S7. Composition (weight percent) and total concentration of organic compounds measured from 22:00 on 4 February 2020 to 4:00 on 5 February.

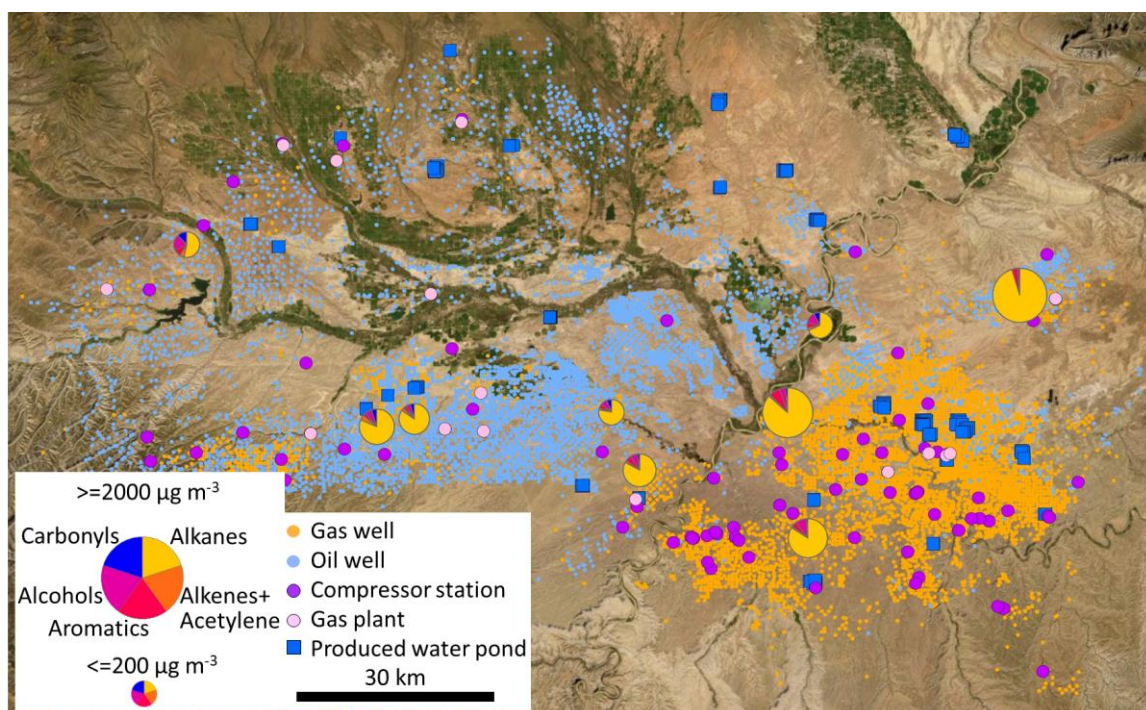


Figure S8. Composition (weight percent) and total concentration of organic compounds measured from 22:00 on 10 February 2020 to 4:00 on 11 February.

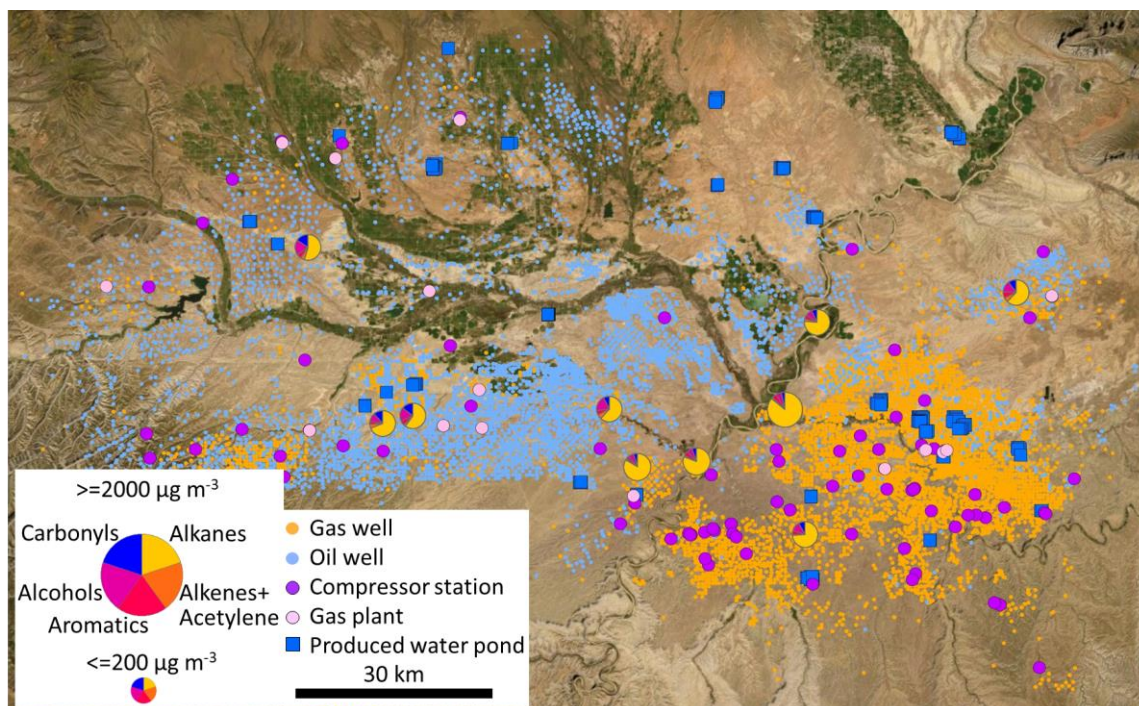


Figure S9. Composition (weight percent) and total concentration of organic compounds measured from 10:00 to 16:00 on 11 February 2020.

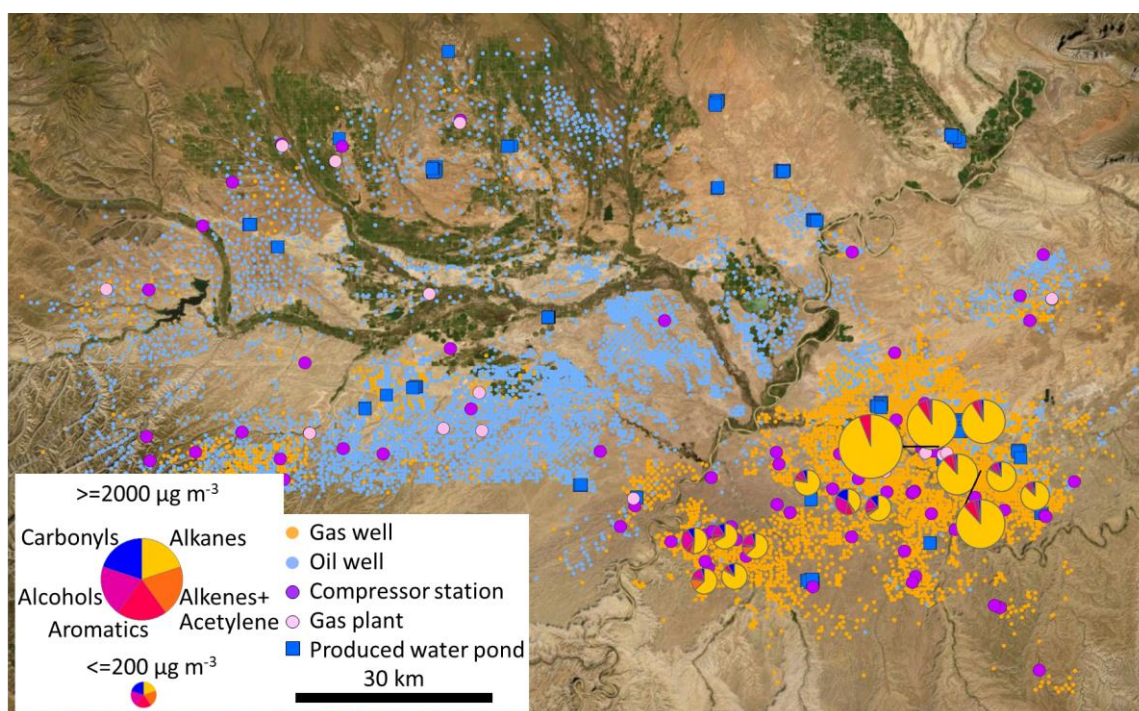


Figure S10. Composition (weight percent) and total concentration of organic compounds measured from 22:00 on 24 February 2020 to 4:00 on 25 February.

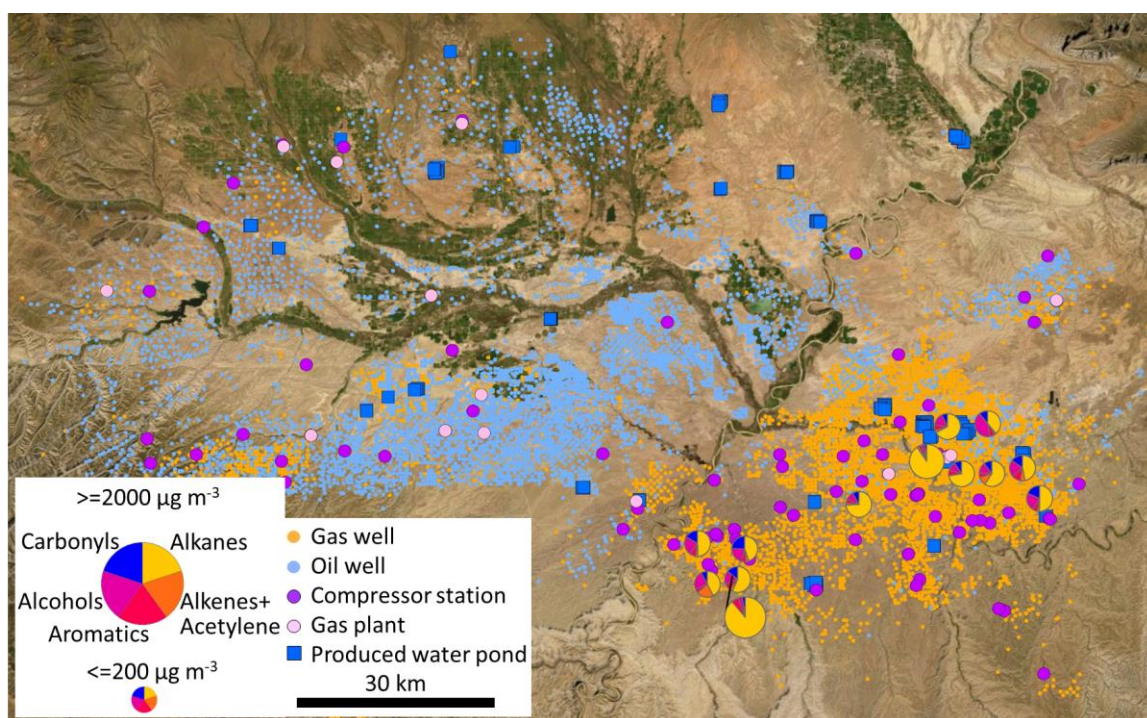


Figure S11. Composition (weight percent) and total concentration of organic compounds measured from 10:00 to 16:00 on 25 February 2020.

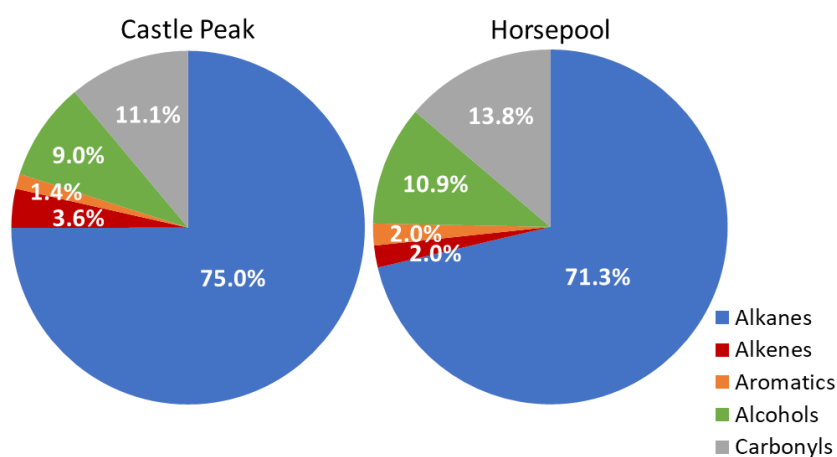


Figure S12. Average composition of organic compounds at the oil production-dominated Castle Peak station and the gas production-dominated Horsepool station in January and February 2020.

Table S1. Spearman rank correlation of concentrations of organic compound types measured with the listed parameters (all sample deployments). Oil and gas-related parameters are the sum within a 10 km radius of each sampling location. Elevation is the average within a 10 km radius. .

All data	TNMHC	Alkanes	Alkenes + acetylene	Aromatics	Alcohols	Carbonyls
TNMHC	--	0.99	0.59	0.78	0.51	0.54
Alkanes	0.99	--	0.55	0.78	0.48	0.55
Alkenes + acetylene	0.59	0.55	--	0.33	0.40	0.38
Aromatics	0.78	0.78	0.33	--	0.52	0.47
Alcohols	0.51	0.48	0.40	0.52	--	0.43
Carbonyls	0.54	0.55	0.38	0.47	0.43	--
Elevation	-0.31	-0.33	--	-0.39	--	--
Engine ct.	--	--	0.30	--	0.23	0.21
Engine VOC emiss.	0.21	0.23	--	--	--	0.18
Gas-fueled engine ct.	--	--	0.30	--	0.23	0.21

Artificial lift engine ct.	--	--	0.31	--	--	0.19
Two-stroke engine ct.	--	--	0.38	--	0.18	0.24
Prod. water pond ct.	--	--	--	--	--	--
Prod. water pond area	--	0.17	--	--	--	--
Dehydrator ct.	--	--	-0.25	0.19	--	--
Dehydrator VOC emiss.	--	--	-0.27	--	--	--
Producing gas well ct.	--	--	-0.26	0.23	--	--
Producing oil well ct.	--	--	0.33	--	--	--
Producing well ct.	--	--	-0.20	--	--	--
Oil production	--	--	0.28	--	--	--
Gas production	--	--	-0.30	0.19	--	--
Water production	--	--	--	--	--	--
Tank ct.	--	--	-0.20	--	--	--
Tank emiss. controls ct.	--	--	-0.29	--	--	-0.17

Table S2. Spearman rank correlation of concentrations of organic compound types measured with the listed parameters (average concentrations from three deployments that occurred at the same sampling locations during February 2019). Oil and gas-related parameters are the sum within a 10 km radius of each sampling location. Elevation is the average within a 10 km radius.

February 2019	TNMHC	Alkanes	Alkenes + acetylene	Aromatics	Alcohols	Carbonyls
TNMHC	--	0.97	0.50	0.37	0.40	0.46
Alkanes	0.97	--	0.41	0.41	0.38	0.49
Alkenes + acetylene	0.50	0.41	--	-0.29	--	--
Aromatics	0.37	0.41	-0.29	--	0.47	0.41
Alcohols	0.40	0.38	--	0.47	--	0.32
Carbonyls	0.46	0.49	--	0.41	0.32	--
Elevation	-0.45	-0.51	--	-0.48	-0.19	-0.31
Engine ct.	--	--	0.28	-0.26	0.21	-0.26
Engine VOC emiss.	--	--	--	--	0.19	--
Gas-fueled engine ct.	--	--	0.28	-0.26	0.21	-0.26
Artificial lift engine ct.	-0.33	-0.39	0.23	-0.36	--	-0.24
Two-stroke engine ct.	-0.38	-0.44	0.22	-0.40	--	-0.24
Prod. water pond ct.	0.54	0.54	0.26	--	--	--
Prod. water pond area	0.59	0.59	0.27	--	--	--
Dehydrator ct.	0.54	0.56	--	0.55	--	0.41
Dehydrator VOC emiss.	0.58	0.60	--	0.54	--	0.37
Producing gas well ct.	0.56	0.61	--	0.55	--	0.30
Producing oil well ct.	-0.43	-0.47	0.23	-0.42	--	-0.28
Producing well ct.	0.51	0.53	--	0.32	--	0.19
Oil production	-0.32	-0.36	0.30	-0.39	--	-0.17
Gas production	0.47	0.53	--	0.40	--	0.26
Water production	--	--	--	--	--	--
Tank ct.	0.49	0.51	--	0.28	--	--
Tank emiss. controls ct.	0.26	0.32	--	--	--	--

Table S3. Spearman rank correlation of concentrations of organic compound types measured with the listed parameters (average concentrations from four deployments that occurred at the same sampling locations during early February 2020). Oil and gas-related parameters are the sum within a 10 km radius of each sampling location. Elevation is the average within a 10 km radius.

Early February 2020	TNMHC	Alkanes	Alkenes + acetylene	Aromatics	Alcohols	Carbonyls
TNMHC	--	0.97	0.54	0.75	0.32	--
Alkanes	0.97	--	0.50	0.65	0.24	--
Alkenes + acetylene	0.54	0.50	--	0.38	0.25	0.29
Aromatics	0.75	0.65	0.38	--	0.59	--
Alcohols	0.32	0.24	0.25	0.59	--	--
Carbonyls	--	--	0.29	--	--	--
Elevation	-0.49	-0.55	-0.19	-0.40	-0.18	--
Engine ct.	--	--	--	--	0.28	--

Engine VOC emiss.	--	--	--	--	0.38	0.18
Gas-fueled engine ct.	--	--	--	--	0.28	--
Artificial lift engine ct.	--	--	--	--	0.20	0.20
Two-stroke engine ct.	--	--	0.17	--	--	0.26
Prod. water pond ct.	--	--	--	--	--	--
Prod. water pond area	--	--	--	--	--	--
Dehydrator ct.	0.37	0.42	--	0.34	0.34	--
Dehydrator VOC emiss.	0.34	0.41	--	0.24	0.18	-0.22
Producing gas well ct.	0.44	0.50	--	0.40	0.20	-0.26
Producing oil well ct.	-0.18	-0.20	0.20	-0.19	--	0.32
Producing well ct.	0.29	0.33	--	0.29	0.35	--
Oil production	-0.18	-0.26	0.26	--	--	0.42
Gas production	0.29	0.32	--	0.29	--	-0.27
Water production	--	--	--	--	--	--
Tank ct.	0.22	0.25	--	0.25	0.38	--
Tank emiss. controls ct.	--	--	--	--	0.25	--