

August 1, 2017

**Air Monitoring Adjacent to the Waste Connections Well Site
Reporting Period: June 5 through June 30, 2017**

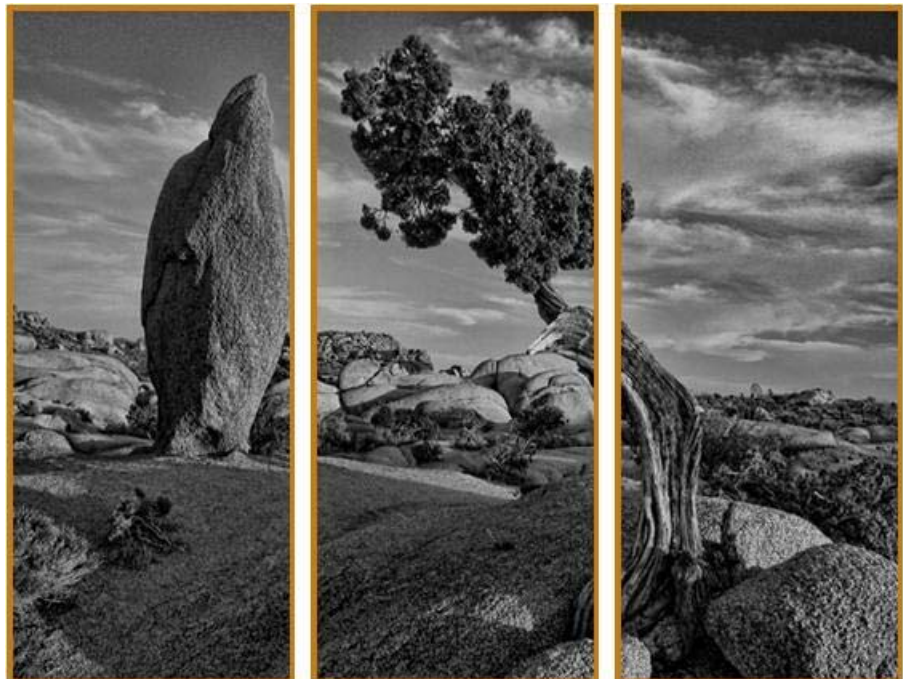
Erie Air Quality Monitoring
Erie, Colorado

Prepared For:

Town of Erie
645 Holbrook Street
Erie, CO 80516

Pinyon Project No.:

1/17-695-02.1200



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I. Introduction

The Town of Erie (Town) has contracted with Pinyon Environmental, Inc., (Pinyon), to perform air quality monitoring near the Crestone Peak Resources (Crestone) Waste Connections well site, hereafter referred to as the Waste Connections well site. Pinyon captured 24-hour air samples every five days at two sampling locations (Figure I-1). Sampling Site 2 is located to the west of Vista Parkway in a residential neighborhood, approximately 1,250 feet to the southwest of the Waste Connections well site. This location was selected by the Town to evaluate potential exposure to residents located closest to the well site. Pinyon collected air samples at Sampling Site 2 from April 15, 2017, through June 30, 2017, including two baseline samples collected prior to when Crestone began operations at the well site. Sampling Site 1 is located 476 feet to the southeast of the Waste Connections well site. This location was selected by the Town to evaluate maximum concentrations adjacent to the well site. At the direction of Town staff, Pinyon began collecting air samples at Sampling Site 1 on June 16, 2017.

A health screening evaluation of compounds detected in the samples collected from June 5, 2017, through June 30, 2017, was conducted to identify exposure for citizens in the area. A statistical analysis of trends in concentrations detected from the start of the sampling, April 15, 2017, through June 30, 2017, was also completed. Crestone began drilling operations on April 25, 2017, and continued activities at the well site throughout this reporting period.

A summary of the data follows:

- From June 16, 2017, through June 30, 2017, 21 of the 67 substances analyzed were detected at Sampling Site 1.
- From June 5, 2017, through June 30, 2017, 26 of the 67 substances analyzed were detected at Sampling Site 2.
- Based on the sampling data, there is a very low potential for short- or long-term health effects due to exposure to these substances.

These conclusions are based on five samples collected at Sampling Site 1 and seven samples collected at Sampling Site 2. Samples were collected for a short period of time. The samples may not have captured all the substances or amounts of substances in the air during times when residents are experiencing exposures. These conclusions are therefore based on limited sampling, conducted during a limited investigation. Concentrations of constituents can be highly variable, and detections may be dependent on a variety of environmental conditions (e.g., date, operations, wind bearings, actual emissions from operations). This sampling may, therefore, not be representative of, or account for, all variables that could be present during all phases of oil and gas operations within the Town.

Figure I-1 Air Sampling Locations



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2. Methodology

2.1 24-hour Summa Canister Air Samples

Pinyon utilized 6-liter Summa canisters to collect the air quality samples. A Summa canister is a spherical stainless steel container that has had the internal surfaces specially passivated using a “Summa” process. The canister is prepared for sampling by evacuating the contents to a vacuum of approximately 29.9 inches of mercury (in Hg). Opening the stainless-steel bellows valve allows the air sample to enter the canister. A 24-hour flow controller was utilized to restrict the flow and allow for collection at the desired flow rate over a period of 24 hours. After a 24-hour sample collection period, the valves were closed and Pinyon returned the canisters to the laboratory for analysis. Summa canister analysis was conducted by ESC Lab Sciences and Origins Laboratory Inc. in accordance with EPA method TO-15 (EPA, 1999). EPA method TO-15 (TO-15) is appropriate for use when sampling a subset of 67 Volatile Organic Compounds (VOCs) which constitute the target analyte list. Typical situations involve ambient air testing associated with the potential exposures from emission sources, including oil and gas operations. In this case sampling and analysis of VOCs was performed to evaluate the potential exposure of dispersing source emissions in the surrounding area. Pinyon collected one 24-hour sample every five days. Table 2-1 and Table 2-2 show the sample collection date and times for Sampling Site 1 and Sampling Site 2.

Table 2-1 June 16, 2017, through June 30, 2017, Sampling Site 1 Collection Dates

Sample Start Date	Sample Start Time	Sample End Date	Sample End Time
6/16/2017	5:55 PM	6/17/2017	5:45 PM
6/20/2017	2:20 PM	6/21/2017	2:00 PM
6/25/2017	2:40 PM	6/26/2017	2:30 PM
6/26/2017	2:40 PM	6/27/2017	2:40 PM
6/30/2017	11:15 AM	7/1/2017	11:00 AM

Table 2-2 June 5, 2017, through June 30, 2017, Sampling Site 2 Collection Dates

Sample Start Date	Sample Start Time	Sample End Date	Sample End Time
6/05/2017	2:30 PM	6/06/2017	2:30 PM
6/15/2017	1:05 PM	6/16/2017	1:00 PM
6/16/2017	6:10 PM	6/17/2017	6:00 PM
6/20/2017	2:30 PM	6/21/2017	2:15 PM
6/26/2017	3:05 PM	6/27/2017	3:00 PM
6/30/2017	11:30 AM	7/1/2017	11:05 AM

On June 10, 2017, Pinyon was scheduled to collect an air sample at Sampling Site 2. Pinyon determined that this sample was not collected in accordance with our Quality Control procedures. After discussing with Town staff, it was decided that this sample would not be reported or analyzed during this reporting period based on these concerns.

2.2 Meteorology

Meteorological data is collected by the National Weather Service (NWS) at the Erie Municipal Airport in 20-minute intervals. The NWS data coinciding with the sampling periods were used to evaluate prevailing wind speed and wind direction during collection. Using the NWS data, a wind rose plot for each sampling location, corresponding to the specific sampling period, was generated by Pinyon. A wind rose plot is a graphical display of the frequency of wind direction and intensity of wind speed, and can be used to identify whether the sample was collected downwind of the well site, and how wind conditions during the sample collection period may affect sample results. A wind rose plots demonstrates the fraction of the observation period where wind speeds are greater than zero and does not illustrate to what extent calm winds are observed during the sampling period. Wind rose plots were used to evaluate the frequency at which Sampling Site 1 and Sampling Site 2 were downwind of the well site and to assess whether periods of high winds were observed. Calm winds and low wind speeds are ideal for the collection of ambient air samples, as under these conditions substances will not rapidly disperse from the sampling location. During periods of recorded high wind speeds or periods when the sampling location is not downwind of the well, the sample may underestimate ambient concentrations.

2.3 Screening Level Health Evaluation

A screening level health evaluation was performed by comparing the concentrations of detectable substances in the air sample with short-term and long-term health limit levels established by federal and state agencies for each detected substance. The health limit levels represent the concentrations at or below which no appreciable health effects are likely to occur to individuals (including sensitive individuals) for a certain exposure period. Concentrations at or below this level can be considered a “safe” level of exposure. The sampling completed for this investigation represents a “snapshot” of the air concentrations in the area during the time of collection, and may not be representative of the potential exposures over a longer period. A generally accepted method for conducting this type of health evaluation is to conduct a two-step screening process:

1. Compare the results of the short-term sample with long-term health screening levels.
 - a) If the substance result is below the long-term health screening level, it is very unlikely that short-term exposure will result in short or long-term negative health consequences. A short-term exposure is considered exposure of 24 hours a day, for up to one year, to that pollutant.
 - b) If the sample result is above the long-term health screening level, then move on to step two. A long-term exposure is considered a minimum of one year of exposure.
2. Compare the results of the short-term sample (substance identified in step one) with short-term health screening levels.
 - a) If the sample result is below the short-term health screening level, it is unlikely that short-term exposure to this substance will result in negative health consequences.

Pinyon utilized health screening levels established by the following agencies in the evaluation:

- Environmental Protection Administration Integrated Risk Information System (IRIS)
- ATSDR MRL (US Agency for Toxic Substances and Disease Registry Minimal Risk Level)
- TCEQ AMCV (Texas Commission on Environmental Quality Air Monitoring Comparison Values)

2.4 Trends in Detected Substances

If a substance was detected above the reporting detection limit (RDL) in one or more samples, Pinyon performed statistical analysis of the data to evaluate trends in concentrations over time. If the substance was not detected by the lab on a specific sampling date, for the statistical analysis Pinyon used a concentration of one-half of the RDL in the graphical display. This approach is supported by the Environmental Protection Agency (EPA) for risk assessments and recognizes that values between the RDL and zero could be present, and that the average value could be as high as half of the RDL (EPA, 1991). Pinyon calculated the Pearson correlation coefficient (R-value) for each detected substance and then determined the p-value to assess whether the trend was statistically significant. The R-value is a statistical variable that is commonly utilized to assess trends in concentrations over time (Davis, 2002). The R-value ranges from -1.0 to 1.0 with an R-value of 1.0 representing a linear increase in measured concentration levels over time and -1.0 representing a linear decrease in measured concentration levels over the reporting period. The closer the R-value is to zero, the less linear the trend in concentration levels over the reporting period. To assess the level of confidence in the calculated R-value, a p-value is calculated. The p-value is based on the magnitude of the R-value and the total number of samples (n) collected in the reporting period. A p-value of less than or equal to 0.05 means that there is a 95% confidence level that the trend is statistically significant.

3. Meteorology

Pinyon utilized the meteorological data as measured in 20-minute intervals from the Erie Municipal Airport to assess the prevailing wind direction, the percent of time Sampling Site 1 and Sampling Site 2 were downwind of the well site and the percent of time calm winds were recorded during the sample collection periods. This data is summarized in Table 3-1 below and wind roses with additional details are located in Appendix A. Although Sampling Site 1 and Sampling Site 2 were not downwind of the well site for prolonged periods when wind speeds were recorded, calm winds were recorded for a significant portion of the sampling period with the exception of the samples collected on June 16, 2017, through June 17, 2017. On these dates Sampling Site 1 was not downwind of the well site for any portion of the sample collection period, Sampling Site 2 was downwind for 2.8% of the sample collection and calm winds were recorded for 22.2% of the sample collection period. Therefore, the sample collected from June 16, 2017, through June 17, 2017, may underestimate ambient concentrations under other meteorological conditions. For the remaining sample collection periods the meteorological conditions were likely to be adequate in representing ambient conditions at Sampling Site 1 and Sampling Site 2.

Table 3-1 Meteorological Data as Measured from the Erie Municipal Airport

Sampling Period	Prevailing Wind Direction	Sampling Site 1 Downwind (%)	Sampling Site 2 Downwind (%)	Calm Winds (%)
6/5/2017—6/6/2017	West, West Northwest	NA	6.9	37.5
6/15/2017—6/16/2017	West, South	NA	5.6	40.3
6/16/2017—6/17/2017	West Southwest, Northeast	0.0	2.8	22.2
6/20/2017—6/21/2017	West, Northeast	2.8	1.4	52.3
6/25/2017—6/26/2017	North, Northwest	0.0	1.4	45.9
6/30/2017—7/1/2017	Southeast	10.1	0.0	62.3

NA Sample collection at Sampling Site 1 did not begin until June 16, 2017

4. Air Sampling Results

Twenty-one of the 67 compounds analyzed by the lab were detected in the five air samples collected by Pinyon at Sampling Site 1, and 26 substances were detected in the seven air samples collected at Sampling Site 2. Ethanol, propene and 2-propanol were not evaluated in the health assessment, since they are of very low health risk and, therefore, do not have health screening levels. The concentrations of all detected substances were below short and long-term health screening levels (Tables 4-1 and 4-2), with the exception of the June 16, 2017, through June 17, 2017, sample collected at Sampling Site 2. For this sample collection period, concentrations of the following substances exceeded long-term health screening levels:

- 4-ethyltoluene
- 1,2,4-trimethylbenzene
- 1,3,5-trimethylbenzene
- m&p-xylenes
- o-xylenes

The detected concentrations at Sampling Site 2, compared to both short- and long-term health screening levels, are detailed in Table 4-2. As described in Section 2.3, Step 2, Pinyon compared the detected values to the short-term health screening levels. Since the sample results are all below the short-term health screening level, standard protocol states that it is unlikely that a short-term exposure to this substance will result in negative health consequences.

4-Ethyltoluene and 1,3,5-trimethylbenzene were not detected in any of the three samples collected after June 16, 2017. 1,2,4-trimethylbenzene, m&p-xylenes and o-xylene were detected at concentrations lower than the long-term health screening levels on the June 20, 2017, through June 21, 2017, sample collection period, but were not detected in any subsequent sample collection periods (Table 2-3). This indicates that the level of exposures measured during the June 16, 2017, through June 17, 2017, sample collection period was a relatively isolated event during the limited sampling program, and that these substances do not appear to pose long-term health risks.

Table 4-1 Air Sampling Results June 16, 2017 through June 30, 2017, at Sampling Site I

Analyte	Sample Concentration (ppb)					Health Screening Level (ppb)	
	6/16/2017	6/20/2017	6/25/2017	6/26/2017*	6/30/2017	Short Term	Long Term
Acetone	4.65	4.47	7.36	5.82	7.29	26,000 ^A	13,000 ^A
Benzene	<0.200	0.345	<0.200	<0.132	<0.200	9,000 ^I	9 ^I
Carbon tetrachloride	<0.200	0.209	<0.200	<0.262	<0.200	2 ^T	20 ^T
Chloromethane	0.620	0.615	0.511	<1.28	0.550	200 ^A	50 ^A
Cyclohexane	<0.200	0.412	0.208	--	<0.200	1,000 ^I	1,743 ^I
Ethanol	5.59	7.69	16.8	2.53	4.75	NA	NA
Ethylbenzene	<0.200	<0.200	0.218	<0.132	<0.200	33,000 ^I	2301 ^I
Trichlorofluoromethane	0.253	0.222	0.398	--	0.252	10,000 ^T	1,000 ^T
Dichlorodifluoromethane	0.399	0.336	0.340	--	0.396	10,000 ^T	1,000 ^T
Heptane	<0.200	0.627	<0.200	0.208	<0.200	850 ^I	85 ^I
n-Hexane	0.383	1.12	0.343	0.495	0.347	1,800 ^I	198 ^I
Methylene Chloride	0.411	<0.200	0.394	0.970	0.262	600 ^A	100 ^T
2-Butanone (MEK)	<1.25	<1.25	1.88	--	<1.25	200,000 ^A	200,000 ^A
2-Propanol	<1.25	<1.25	1.81	--	<1.25	NA	NA
Tetrachloroethylene	0.613	<0.200	<0.200	--	<0.200	1,000 ^T	10 ^T
Tetrahydrofuran	<0.200	<0.200	2.00	0.201	<0.200	680 ^I	680 ^I
Toluene	0.428	1.01	1.90	<0.394	0.320	2,000 ^A	1,327 ^I
1,2,4-Trimethylbenzene	0.391	0.312	<0.200	<0.269	<0.200	250 ^T	25 ^T
2,2,4-Trimethylpentane	<0.200	0.289	<0.200	--	<0.200	75 ^T	750 ^T
m&p-Xylene	0.412	0.689	0.710	<0.380	<0.400	2,000 ^A	23 ^I
o-Xylene	<0.200	0.228	0.263	<0.132	<0.200	2,000 ^A	23 ^I

Note: Samples collected on June 26, 2017, were analyzed by Origins Laboratory Inc., and were not analyzed for cyclohexane, trichlorofluoromethane, dichlorodifluoromethane, 2-butanone (MEK), 2-propanol, tetrachloroethylene, or 2,2,4-trimethylpentane.

I IRIS (Environmental Protection Agency Integrated Risk Information System), A ATSDR MRL (US Agency for Toxic Substances and Disease Registry Minimal Risk Level)

T TCEQ AMCV (Texas Commission on Environmental Quality Air Monitoring Comparison Value)

NA no health value available

ppb parts per billion

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Table 4-2 Air Sampling Results June 5, 2017 through June 30, 2017, at Sampling Site 2

Analyte	Sample Concentration (ppb)						Health Screening Level (ppb)	
	6/5/2017	6/15/2017	6/16/2017	6/20/2017	6/26/2017*	6/30/2017	Short Term	Long Term
Acetone	3.80	7.68	349	9.67	9.08	5.67	26,000 ^A	13,000 ^A
Benzene	<0.200	<0.200	0.275	0.391	0.132	<0.200	9,000 ^I	9 ^I
Carbon tetrachloride	<0.200	<0.200	<0.262	0.250	<0.262	<0.200	2 ^T	20 ^T
Chloroethane	<0.200	<0.200	0.427	<0.200	<0.133	<0.200	3,788 ^I	15 ^A
Chloromethane	0.556	0.562	1.28	0.592	--	0.505	200 ^A	50 ^A
Cyclohexane	<0.200	<0.200	<0.200	0.267	--	<0.200	1,000 ^I	1,743 ^I
1,4-Dioxane	<0.200	<0.200	0.655	<0.200	--	<0.200	2000 ^A	20 ^A
Ethanol	5.02	5.92	438	10.0	3.06	4.55	NA	NA
Ethylbenzene	<0.200	<0.200	22.0	<0.200	<0.132	<0.200	33,000 ^I	2301 ^I
4-Ethyltoluene	<0.200	<0.200	60.0	<0.200	<0.201	<0.200	250 ^T	25 ^T
Trichlorofluoromethane	0.243	0.244	0.257	0.210	--	0.254	10,000 ^T	1,000 ^T
Dichlorodifluoromethane	0.292	0.354	0.319	0.387	--	0.397	10,000 ^T	1,000 ^T
Heptane	<0.200	<0.200	0.561	0.404	0.436	<0.200	850 ^I	85 ^I
n-Hexane	0.309	0.349	0.347	0.876	1.11	0.422	1,800 ^I	198 ^I
Isopropylbenzene	<0.200	<0.200	6.76	<0.200	<0.132	<0.200	50 ^T	500 ^T
Methylene Chloride	<0.200	0.220	0.211	<0.200	<0.950	0.266	600 ^A	100 ^T
2-Butanone (MEK)	<1.25	<1.25	26.0	<1.25	--	<1.25	200,000 ^A	200,000 ^A
Naphthalene	<0.630	<0.630	3.00	<0.630	<0.630	<0.630	189 ^I	7 ^A
2-Propanol	<1.25	1.91	12.6	1.49	--	<1.25	NA	NA
Tetrahydrofuran	<0.200	<0.200	22.1	0.597	0.432	<0.200	680 ^I	680 ^I
Toluene	0.562	0.390	4.52	1.27	0.472	0.409	2,000 ^A	1,327 ^I
1,2,4-Trimethylbenzene	<0.200	<0.200	199	0.258	<0.269	<0.200	250 ^T	25 ^T
1,3,5-Trimethylbenzene	<0.200	<0.200	64.1	<0.200	--	<0.200	250 ^T	25 ^T
2,2,4-Trimethylpentane	<0.200	<0.200	0.873	0.386	--	<0.200	75 ^T	750 ^T
m&p-Xylene	<0.400	<0.400	240	0.840	<0.380	0.430	2,000 ^A	23 ^I
o-Xylene	<0.200	<0.200	73.8	0.290	<0.132	<0.200	2,000 ^A	23 ^I

I IRIS (Environmental Protection Agency Integrated Risk Information System), A ATDSR MRL (US Agency for Toxic Substances and Disease Registry Minimal Risk Level)

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T TCEQ AMCV (Texas Commission on Environmental Quality Air Monitoring Comparison Value)
NA no health value available
ppb parts per billion

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Erie, Colorado

5. Trends in Detected Substances

5.1 Sampling Site 1

Pinyon calculated the R-value and p-value for all substances detected from June 16, 2017, through June 30, 2017, at Sampling Site 1 (Table 5-1). The p-value was greater than 0.05 for all substances, which indicates that any trends are not statistically significant during this reporting period except for 1,2,4-trimethylbenzene. The calculated R-value for 1,2,4-Trimethylbenzene is -0.94 and the p-value is 0.02. This implies that measured concentrations of 1,2,4-trimethylbenzene are decreasing over time at greater than the 95% confidence level. This reporting period constituted a relatively small sample size (n=5), and it is possible that as subsequent samples are collected at Sampling Site 1, additional statistically significant trends in detected substances over time could be confirmed.

Table 5-1 R-value and p-value of Detected Substances at Sampling Site 1

Substance	R-value	p-value
Acetone	0.84	0.07
Benzene	-0.37	0.54
Carbon tetrachloride	-0.28	0.65
Chloromethane	-0.48	0.41
Cyclohexane	-0.33	0.67
Ethanol	0.02	0.97
Ethylbenzene	0.08	0.90
Trichlorofluoromethane	0.10	0.90
Dichlorodifluoromethane	-0.26	0.74
Heptane	-0.30	0.70
n-Hexane	-0.35	0.56
Methylene Chloride	0.21	0.73
2-Butanone (MEK)	0.03	0.97
2-Propanol	0.02	0.98
Tetrachloroethylene	-0.76	0.24
Tetrahydrofuran	0.18	0.77
Toluene	-0.06	0.92
1,2,4-Trimethylbenzene	-0.94	0.02
2,2,4-Trimethylpentane	-0.39	0.61
m&p-Xylene	-0.44	0.46
o-Xylene	-0.14	0.82

5.2 Sampling Site 2

Pinyon calculated the R-value and p-value for all substances detected from April 15, 2017, through June 30, 2017, at Sampling Site 2 (Table 5-1). The p-value was greater than 0.05 for all substances, which indicates that any trends are not statistically significant during this reporting period except for benzene, heptane and methylene chloride. The calculated R-value for benzene is 0.49 and the p-value is 0.04. The calculated R-value for heptane is 0.54 and the p-value is 0.03. The calculated R-value for methylene chloride is 0.64 and the p-value is 0.01. This indicates that measured concentrations of benzene, heptane and methylene chloride are

increasing over time at greater than the 95% confidence level. Although measured levels of these substances are increasing over time, their detected concentrations have remained below short-term and long-term health screening levels (Section 4). This reporting period constituted a relatively small sample size (n=17). Statistically significant trends may be confirmed through additional sampling

Table 5-2 R-value and p-value of Detected Substances at Sampling Site 2

Substance	R-value	p-value
Acetone	0.27	0.29
Benzene	0.49	0.04
Carbon disulfide	-0.12	0.66
Carbon tetrachloride	0.37	0.14
Chloroethane	0.21	0.42
Chloromethane	0.24	0.37
Cyclohexane	0.04	0.88
cis-1,2,-Dichloroethane	-0.17	0.51
1,4-Dioxane	0.09	0.74
Ethanol	0.26	0.31
4-Ethyltoluene	0.25	0.33
Trichlorofluoromethane	0.42	0.11
Dichlorodifluoromethane	0.33	0.21
Heptane	0.54	0.03
n-Hexane	0.45	0.07
Isopropylbenzene	0.25	0.35
Methylene Chloride	0.64	0.01
2-Butanone (MEK)	0.24	0.37
Naphthalene	0.28	0.28
2-Propanol	0.27	0.31
Propene	-0.30	0.26
Tetrachloroethylene	-0.32	0.23
Tetrahydrofuran	0.26	0.31
Toluene	0.24	0.35
Trichloroethylene	-0.40	0.12
1,2,4-Trimethylbenzene	0.25	0.33
1,3,5-Trimethylbenzene	0.25	0.35
2,2,4-Trimethylpentane	0.30	0.26
m&p-Xylene	0.25	0.33
o-Xylene	0.25	0.33

6. Conclusions

Pinyon collected 24-hour air samples every five days at Sampling Site 2 from April 15, 2017, to June 30, 2017. In addition to the samples collected at Sampling Site 2, Pinyon began collecting 24-hour air samples every five days at Sampling Site 1 on June 16, 2017. The air sample measurements collected reflect well drilling and completion activities at a unique well site in Erie, Colorado. The following limitations must be considered before definitive conclusions can be made:

- Samples collected for a short amount of time may not accurately represent continuous exposure or the ranges of potential exposures.
- These samples reflect exposures in that area for a period of time, and are not intended to identify the source of exposures. The substances identified in the sample could come from multiple sources.
- Samples collected during other phases of operations and different weather conditions may have very different results.
- The samples were analyzed for a limited set of substances that could be present in the air.

Based on the results from the air sampling data collected at both well pads, it is unlikely that short-term exposure would result in negative health effects. There were no exceedances of short-term health screening levels at either sampling location. There were exceedances of long-term health screening levels for five substances at Sampling Site 2 on June 16 through 17, 2017. As described in Section 2.3, Step 2, Pinyon compared the detected values to the short-term health screening levels. Since the sample results are all below the short-term health screening level, accepted protocol states that it is unlikely that this exposure to this substance will result in negative health consequences. In addition, the exceedances of the long-term health screening levels occurred during a single air sample and were not replicated in the other samples collected at Sampling Site 2.

The air monitoring data provided in this report provides a general understanding of ambient concentrations of select pollutants adjacent to the well site during various phases of Crestone's activities. Based on meteorology data collected at the Erie Municipal Airport, the air sampling locations are generally representative of ambient conditions. However, on select sampling days the sampling locations were not downwind of the well site and significant periods of calm winds were not recorded. Thus, the air samples collected during these periods may not represent concentrations that citizens would be exposed to at locations downwind of the well site, or may underrepresent maximum exposure levels.

These conclusions are based on limited sampling, conducted during a limited investigation. Concentrations of constituents can be highly variable, and detections may be dependent on a variety of environmental conditions (e.g., date, operations, wind bearings, actual emissions from operations). This sampling may, therefore, not be representative of, or account for all variables that could be present during oil and gas operations within Erie and should not be considered conclusive of future operations.

7. References

Davis, J., 2002. "Statistics and Data Analysis in Geology." Wiley. ISBN: 978-0-471-17275-8

Environmental Protection Agency (EPA), 1991. "Chemical Concentration Data Near the Detection Limit.;" EPA/903/8-91/001.

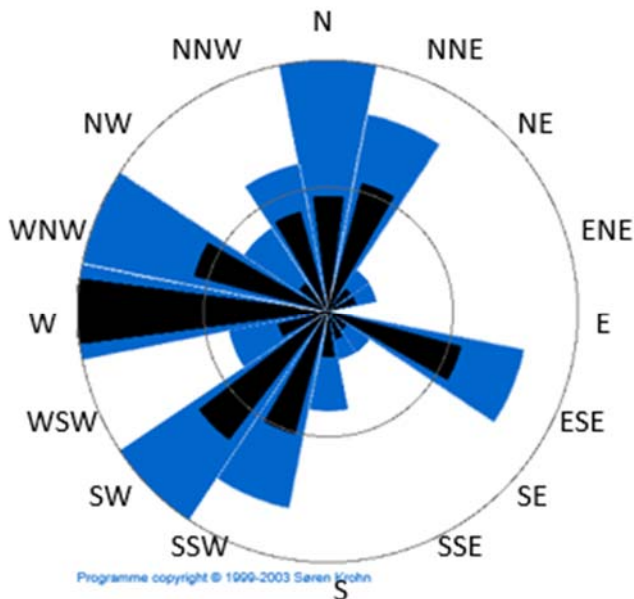
Environmental Protection Agency (EPA), 1999. "Compendium Method TO-15: Determination of Volatile Organic Compounds (VOCs) In Air Collected in Specially-Prepared Canisters and Analyzed by Gas Chromatography/Mass Spectrometry (GC/MS)."

Appendix A Wind Roses During Sample Collection Periods

Air Monitoring Adjacent to the Waste Connections Well Site
Reporting Period: June 5 through June 30, 2017

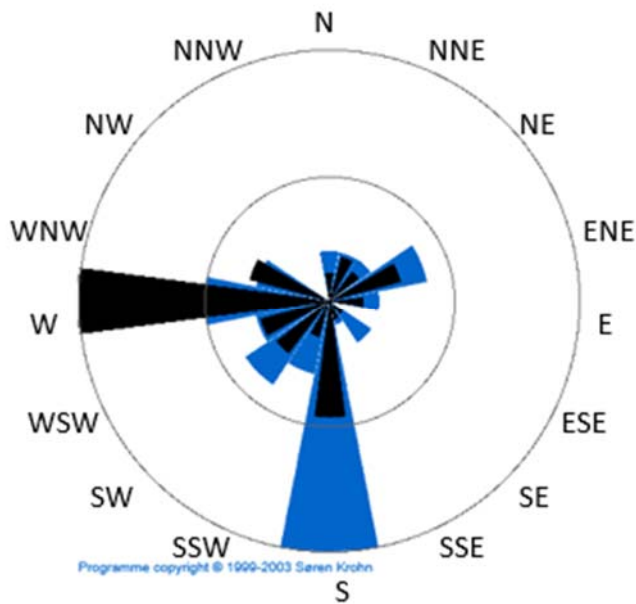
Erie Air Quality Monitoring
Erie, Colorado

Wind Rose for June 5, 2017, at 2:30 PM through June 6, 2017, at 2:30 PM



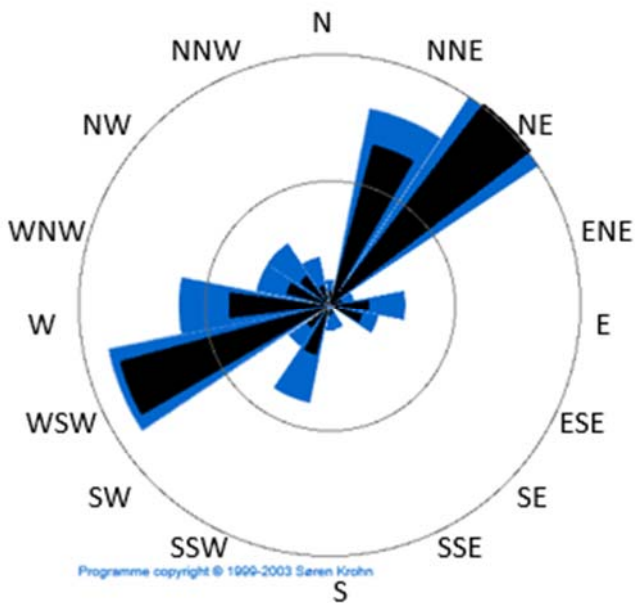
Weather conditions observed during the June 5, 2017, through June 6 2017, sample collection period were breezy with wind speeds varying from 0 to 16 miles per hour (mph). The prevailing wind directions were to the west northwest, west and southwest. During this period, Sampling Site 2 was downwind for 6.9% of the sampling period. Although Sampling Site 2 was not downwind of the well site for prolonged periods when wind speeds were recorded, calm winds were recorded for 37.5% of the sampling period. Therefore, the sample collected from June 5, 2017, through June 6, 2017, is likely to be adequate in representing ambient conditions at Sampling Site 2.

Wind Rose for June 15, 2017, at 1:00 PM through June 6, 2017, at 1:00 PM



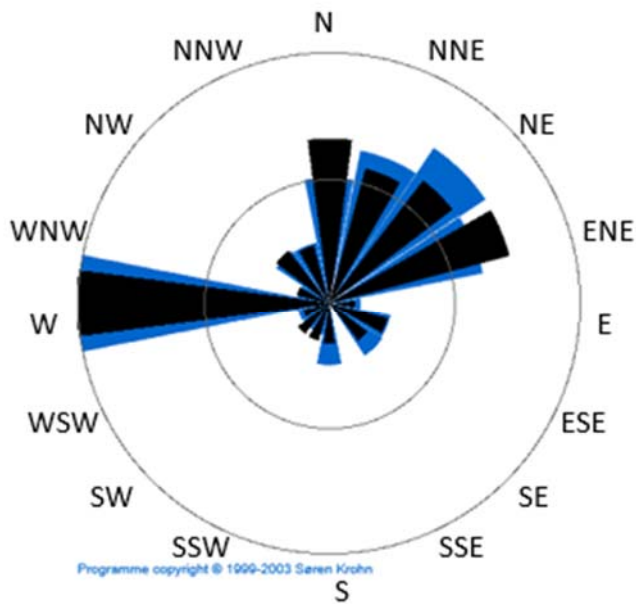
Weather conditions observed during the June 15, 2017, through June 16 2017, sample collection period were breezy with wind speeds varying from 0 to 9 mph and occasional gusts up to 25 mph. The prevailing wind directions were to the west and south. During this period, Sampling Site 2 was downwind for 5.6% of the sampling period. Although Sampling Site 2 was not downwind of the well site for prolonged periods when wind speeds were recorded, calm winds were recorded for 40.3% of the sampling period. Therefore, the sample collected from June 15, 2017, through June 16, 2017, is likely to be adequate in representing ambient conditions at Sampling Site 2.

Wind Rose for June 16, 2017, at 5:45 PM through June 17, 2017, at 6:00 PM



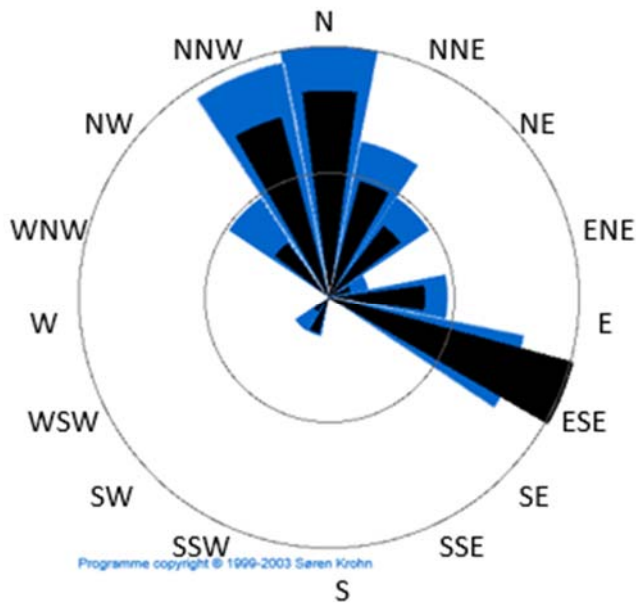
Weather conditions observed during the June 16, 2017, through June 17, 2017, sample collection period were breezy with wind speeds varying from 0 to 17 mph. The prevailing wind directions were to the west-southwest and northeast. During this period, Sampling Site 1 was not downwind of the well site for any portion of the sampling period and Sampling Site 2 was downwind for 2.8% of the sampling period. Calm winds were recorded for less than a quarter (22.2%) of the sampling period. Therefore, the sample collected from June 16, 2017, through June 17, 2017, may underestimate ambient concentrations under other meteorological conditions.

Wind Rose for June 20, 2017, at 2:15 PM through June 21, 2017, at 2:15 PM



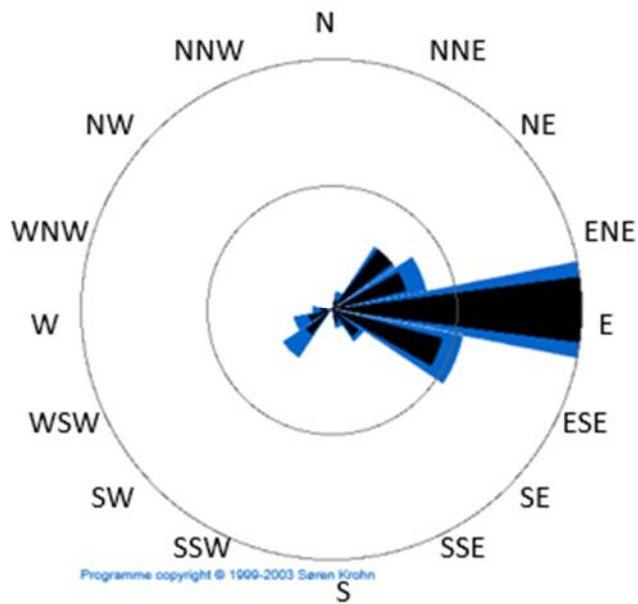
Weather conditions observed during the June 20, 2017, through June 21, 2017, sample collection period were breezy with wind speeds varying from 0 to 14 mph. The prevailing wind directions were to the west and northeast. During this period, Sampling Site 1 was downwind of the well site for 2.8% of the sampling period and Sampling Site 2 was downwind for 1.4% of the sampling period. Although Sampling Site 1 and Sampling Site 2 were not downwind of the well site for prolonged periods when wind speeds were recorded, calm winds were recorded for 40.3% of the sampling period. Therefore, the sample collected from June 20, 2017, through June 21, 2017, is likely to be adequate in representing ambient conditions at Sampling Site 1 and Sampling Site 2.

Wind Rose for June 25, 2017, at 2:30 PM through June 26, 2017, at 2:30 PM



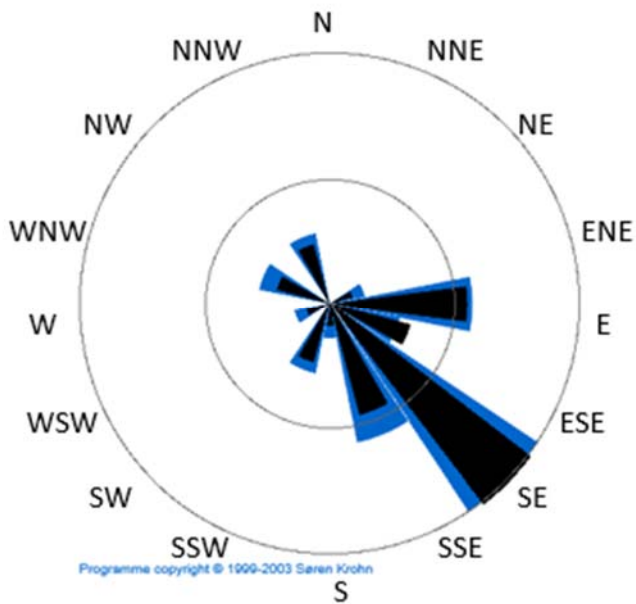
Weather conditions observed during the June 25, 2017, through June 26, 2017, sample collection period were breezy with wind speeds varying from 0 to 10 mph. The prevailing wind directions were to the north, north northwest and east southeast. During this period, Sampling Site 1 was not downwind of the well site for any portion of the sampling period and Sampling Site 2 was downwind for 1.4% of the sampling period. Although Sampling Site 1 and Sampling Site 2 were not downwind of the well site for prolonged periods when wind speeds were recorded, calm winds were recorded for 52.3% of the sampling period. Therefore, the sample collected from June 25, 2017, through June 26, 2017, is likely to be adequate in representing ambient conditions at Sampling Site 1 and Sampling Site 2.

Wind Rose for June 26, 2017, at 2:40 PM through June 27, 2017, at 3:00 PM



Weather conditions observed during the June 26, 2017, through June 27, 2017, sample collection period were breezy with wind speeds varying from 0 to 10 mph. The prevailing wind direction was to the east. During this period, Sampling Site 1 was downwind of the well site for 2.8% of the sampling period and Sampling Site 2 was downwind for 4.2% of the sampling period. Although Sampling Site 1 and Sampling Site 2 were not downwind of the well site for prolonged periods when wind speeds were recorded, calm winds were recorded for 45.9% of the sampling period. Therefore, the sample collected from June 20, 2017, through June 21, 2017, is likely to be adequate in representing ambient conditions at Sampling Site 1 and Sampling Site 2.

Wind Rose for June 30, 2017, at 11:15 AM through July 1, 2017 at 11:15 AM



Weather conditions observed during the June 30, 2017, through July 1, 2017, sample collection period had low wind speeds varying from 0 to 6 mph with occasional gusts up to 8 mph. The prevailing wind direction was to the southeast. During this period, Sampling Site 1 was downwind of the well site for 10.1% of the sampling period and Sampling Site 2 was not downwind for any portion the sampling period. Although Sampling Site 1 and Sampling Site 2 were not downwind of the well site for prolonged periods when wind speeds were recorded, calm winds were recorded for 62.3% of the sampling period. Therefore, the sample collected from June 30, 2017, through July 1, 2017, is likely to be adequate in representing ambient conditions at Sampling Site 1 and Sampling Site 2.