



TECHNICAL MEMORANDUM

SALTON SEA - AMBIENT AIR QUALITY MONITORING NETWORK 2016-2017 DATA REVIEW

PREPARED FOR: Imperial Irrigation District

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DATE: August 15, 2018

This technical memorandum provides an overview of data collected by the Salton Sea Air Quality Monitoring Network (SSAQMN) operated by the Salton Sea Air Quality Team (Team) for the period 2016-2017 and includes an overview of the data review QA/QC procedures used to review and validate the data gathered from the monitoring network.

This memo accompanies a data package that includes meteorological and particulate data for each station over the two-year period. Within the datasets, invalidated parameters are marked "NA" in place of a data value, and the documented reason(s) for the invalidation are concatenated into a single column in each file.

1 2016 DATA SUMMARY

Major notable events in 2016 included the takeover of maintenance of the network by the Salton Sea Air Quality Team on August 1, 2016 and a reconfiguration of the stations starting in October 2016 and ending January 1, 2017. The station reconfiguration consisted of changing data-logging methods, removing the sonic anemometers, removing the 1m and 2m anemometers, and replacing old/outdated sensors. The sonic anemometers were plagued by calibration and maintenance problems and were deemed impractical to continue using. The 1m and 2m anemometers at each station were obstructed by fencing, and therefore were considered inadequately sited with no possible alternative for improvement.

1.1 2016 METEOROLOGICAL DATA HIGHLIGHTS

Basic summary statistics are presented below for each of the six meteorological stations that are part of the SSAQMN. The close-out audits during the station reconfigurations resulted in several failed meteorological sensors that were consequently invalidated back to the previous audit (the CARB audit in 2016 Q1), resulting in low data recovery for some parameters. The net radiation sensors at several sites were found to be out of calibration during the 2016 Q1 CARB audit, and it was determined infeasible to bring them back into calibration after multiple attempts. These sensors were not replaced until the end of 2017.

TABLE 1. BOMBAY BEACH METEOROLOGICAL DATA STATISTICS FOR 2016

Parameter	Mean	Max	Min	% Recovery	Notes
Ambient Temperature (2m, °C)	17.36	34.45	3.4	36.8%	Failed close-out audit, invalidated back to previous audit; sensor replaced 10/4/16
Barometric Pressure (2m, atm)	NA	NA	NA	NA	Not measured at this station
Delta Temperature (°C)	0.99	6.12	-0.96	22.0%	Failed close-out audit, invalidated back to previous audit; sensors replaced 10/4/16
Net Radiation (Wm ⁻²)	16.11	335.3	-92.7	11.0%	Failed CARB audit and was not able to be recalibrated
Precipitation (mm)	NA	NA	NA	NA	Not measured at this station
Relative Humidity (2m, %)	42.74	102.6	5.32	92.1%	Sensor replaced 10/4/16
Solar Radiation (Wm ⁻²)	NA	NA	NA	NA	Installed Dec 2017
Sonic 2D WD (10m, deg)		360	0	69.7%	Frequent errors reported by instrument and multiple missing data periods; Removed 10/4/16
Sonic 2D WS (10m, ms ⁻¹)	3.29	18.5	0.06	69.7%	Frequent errors reported by instrument and multiple missing data periods; Removed 10/4/16
Wind Direction (10m, deg)		360	0.03	22.0%	Installed 10/4/16
Wind Direction SD (10m, deg)	23.01	100	2.85	22.0%	Installed 10/4/16
Wind speed (10m, ms ⁻¹)	3.29	18.4	0.11	92.2%	Sensor replaced 10/4/16
Wind speed (1m, ms ⁻¹)	2.26	13.2	0.2	70.2%	Removed 10/4/16
Wind speed (2m, ms ⁻¹)	2.67	14.8	0.27	70.2%	Removed 10/4/16

TABLE 2. NAVAL TEST BASE METEOROLOGICAL DATA STATISTICS FOR 2016

Parameter	Mean	Max	Min	% Recovery	Notes
Ambient Temperature (2m, °C)	17.01	34.18	2.57	31.3%	Failed close-out audit, invalidated back to previous audit; sensor replaced 10/14/16
Barometric Pressure (2m, atm)	NA	NA	NA	NA	Not measured at this station
Delta Temperature (°C)	1.53	8.55	-0.92	17.6%	Failed close-out audit, invalidated back to previous audit; sensors replaced 10/14/16
Net Radiation (Wm ⁻²)				0.0%	Failed CARB audit and was not able to be recalibrated
Precipitation (mm)	NA	NA	NA	NA	Not measured at this station
Relative Humidity (2m, %)	32.75	99.4	0.3	88.9%	Sensor replaced 10/14/16
Solar Radiation (Wm ⁻²)	NA	NA	NA	NA	Installed Dec 2017
Sonic 2D WD (10m, deg)		359.91	0.12	49.5%	Frequent errors reported by instrument and multiple missing data periods; Removed 10/14/16
Sonic 2D WS (10m, ms ⁻¹)	4.16	18.2	0.01	49.5%	Frequent errors reported by instrument and multiple missing data periods; Removed 10/14/16
Wind Direction (10m, deg)		359.7	0.04	17.6%	Installed 10/14/16
Wind Direction SD (10m, deg)	23.65	98.1	1.46	17.6%	Installed 10/14/16
Wind speed (10m, ms ⁻¹)	4.29	18.44	0.07	89.0%	Sensor replaced 10/14/16
Wind speed (1m, ms ⁻¹)	2.32	11.49	0.01	60.6%	Removed 10/14/16
Wind speed (2m, ms ⁻¹)	2.96	12.96	0.01	68.6%	Removed 10/14/16

TABLE 3. SALTON CITY METEOROLOGICAL DATA STATISTICS FOR 2016

Parameter	Mean	Max	Min	% Recovery	Notes
Ambient Temperature (2m, °C)	24.62	47.95	0.42	82.3%	Sensor replaced 10/14/16
Barometric Pressure (2m, atm)	NA	NA	NA	NA	Not measured at this station
Delta Temperature (°C)	1.04	6.73	-1.25	21.7%	Failed close-out audit, invalidated back to previous audit; sensors replaced 10/14/16
Net Radiation (Wm ⁻²)	52.42	487.34	-176.45	82.3%	
Precipitation (mm)	NA	NA	NA	NA	Not measured at this station
Relative Humidity (2m, %)	36.97	100.1	4.3	82.3%	Sensor replaced 10/14/16
Solar Radiation (Wm ⁻²)	NA	NA	NA	NA	Installed Dec 2017
Sonic 2D WD (10m, deg)		359.7	0	39.6%	Frequent errors reported by instrument and multiple missing data periods; Removed 10/14/16
Sonic 2D WS (10m, ms ⁻¹)	3.41	16.3	0	39.6%	Frequent errors reported by instrument and multiple missing data periods; Removed 10/14/16
Wind Direction (10m, deg)		359.8	0.04	21.7%	Installed 10/14/16
Wind Direction SD (10m, deg)	21.19	98.4	3.12	21.7%	Installed 10/14/16
Wind speed (10m, ms ⁻¹)	3.54	16.9	0.19	82.3%	Sensor replaced 10/14/16
Wind speed (1m, ms ⁻¹)	1.59	7.9	0.08	25.8%	Removed 10/14/16
Wind speed (2m, ms ⁻¹)	2.13	9.79	0.11	25.8%	Removed 10/14/16

TABLE 4. SALTON SEA PARK METEOROLOGICAL DATA STATISTICS FOR 2016

Parameter	Mean	Max	Min	% Recovery	Notes
Ambient Temperature (2m, °C)	16.04	33.7	3.5	14.9%	Failed close-out audit, invalidated back to previous audit; sensor replaced 12/21/16
Barometric Pressure (2m, atm)	NA	NA	NA	NA	Not measured at this station
Delta Temperature (°C)	0.17	0.34	-0.23	0.10%	Failed close-out audit and CARB audit, invalidated back to previous audit; sensors replaced 12/21/16
Net Radiation (Wm ⁻²)	81.45	636.22	-166	91.4%	
Precipitation (mm)	NA	NA	NA	NA	Not measured at this station
Relative Humidity (2m, %)	39	100.6	4	96.2%	Sensor replaced 12/21/16
Solar Radiation (Wm ⁻²)	NA	NA	NA	NA	Installed Dec 2017
Sonic 2D WD (10m, deg)		360	0	76.6%	Removed 12/21/16
Sonic 2D WS (10m, ms ⁻¹)	2.25	11.83	0	76.6%	Removed 12/21/16
Wind Direction (10m, deg)		181.5	95.3	0.10%	Installed 12/21/16
Wind Direction SD (10m, deg)	39.4	96.6	13.35	0.10%	Installed 12/21/16
Wind speed (10m, ms ⁻¹)	2.21	11.8	0	71.5%	Sensor replaced 12/21/16
Wind speed (1m, ms ⁻¹)	0.71	4.8	0.06	71.4%	Removed 12/21/16
Wind speed (2m, ms ⁻¹)	1.07	6.7	0.07	71.4%	Removed 12/21/16

TABLE 5. SONNY BONO METEOROLOGICAL DATA STATISTICS FOR 2016

Parameter	Mean	Max	Min	% Recovery	Notes
Ambient Temperature (2m, °C)	23.16	46.43	0.55	95.8%	Sensor replaced 10/3/16
Barometric Pressure (2m, atm)	1.01	1.02	1.00	19.9%	Installed 10/3/16
Delta Temperature (°C)	1.02	8.04	-1.86	23.9%	Failed close-out audit, invalidated back to previous audit; sensors replaced 10/3/16
Net Radiation (Wm ⁻²)	NA	NA	NA	0.0%	Failed CARB audit and was not able to be recalibrated
Precipitation (mm)	0.02	5.6	0	19.9%	Installed 10/3/16
Relative Humidity (2m, %)	49.88	100	4.96	95.8%	Sensor replaced 10/3/16
Solar Radiation (Wm ⁻²)	NA	NA	NA	NA	Installed Dec 2017
Sonic 2D WD (10m, deg)		359.9	0.4	41.7%	Removed 10/3/16
Sonic 2D WS (10m, ms ⁻¹)	4.06	17.94	0.45	41.7%	Removed 10/3/16
Wind Direction (10m, deg)		359.7	0.04	38.5%	Replaced 10/3/16 (this station already had a vane-style anemometer); Failed close-out audit, invalidated back to previous audit
Wind Direction SD (10m, deg)	22.5	98.9	2.9	23.9%	Installed 10/3/16 (data not captured with previous vane)
Wind speed (10m, ms ⁻¹)	3.52	19.09	0.1	95.8%	Sensor replaced 10/3/16
Wind speed (1m, ms ⁻¹)	1.61	7.03	0	72.0%	Removed 10/3/16
Wind speed (2m, ms ⁻¹)	1.99	8.93	0	72.0%	Removed 10/3/16

TABLE 6. TORRES MARTINEZ METEOROLOGICAL DATA STATISTICS FOR 2016

Parameter	Mean	Max	Min	% Recovery	Notes
Ambient Temperature (2m, °C)	23.38	49.2	-2.7	94.8%	Sensor replaced 12/20/16
Barometric Pressure (2m, atm)	NA	NA	NA	NA	Not measured at this station
Delta Temperature (°C)	0.1	0.61	-0.62	0.13%	Failed close-out audit and CARB audit, invalidated back to previous audit; sensors replaced 12/20/16
Net Radiation (Wm ⁻²)	NA	NA	NA	0.0%	Failed CARB audit and was not able to be recalibrated
Precipitation (mm)	0.19	1.1	0	0.13%	Installed 12/20/16
Relative Humidity (2m, %)	43.37	103.2	6.2	90.4%	Sensor replaced 12/20/16
Solar Radiation (Wm ⁻²)	NA	NA	NA	NA	Installed Dec 2017
Sonic 2D WD (10m, deg)		359.86	0.1	66.8%	Removed 12/20/16
Sonic 2D WS (10m, ms ⁻¹)	2.82	11	0.03	66.8%	Removed 12/20/16
Wind Direction (10m, deg)		359.7	105.8	0.13%	Installed 12/20/16
Wind Direction SD (10m, deg)	37.3	79.47	13.82	0.13%	Installed 12/20/16
Wind speed (10m, ms ⁻¹)	2.76	10.9	0.2	75.5%	Sensor replaced 12/20/16
Wind speed (1m, ms ⁻¹)	1.14	7.1	0.2	24.4%	Removed 12/20/16
Wind speed (2m, ms ⁻¹)	1.56	7.27	0.11	56.4%	Removed 12/20/16

1.2 2016 PARTICULATE DATA HIGHLIGHTS

Data recovery was fairly consistent across the six stations over the course of the year. The one notable exception was Salton Sea Park, which had ongoing issues related to the internal logic boards and the cap heater; this was not fully resolved until 2017 Q1. In addition, PM₁₀ at standard temperature and pressure (PM₁₀STP) data was not calculable until the station transition, since pressure data recorded by the TEOMs were not being reported correctly from the old data loggers.

TABLE 7. BOMBAY BEACH PARTICULATE DATA STATISTICS FOR 2016

Parameter (µgm ⁻³)	Mean	Max	Min	% Recovery	Notes
PM Coarse	28	6,624	-22.2	88.3%	
PM ₁₀ local	32.76	7,208	-28.1	88.3%	
PM ₁₀ STP	17.33	700.3	-13.06	35.7%	
PM _{2.5}	4.77	583.1	-29.6	88.3%	

TABLE 8. NAVAL TEST BASE PARTICULATE DATA STATISTICS FOR 2016

Parameter (µgm ⁻³)	Mean	Max	Min	% Recovery	Notes
PM Coarse	79.09	23,191	-42.2	86.0%	
PM ₁₀ local	90.68	24,535	-39.75	86.0%	
PM ₁₀ STP	48.62	7,858	-32.2	34.2%	
PM _{2.5}	11.53	1,343	-15.24	86.0%	

TABLE 9. SALTON CITY PARTICULATE DATA STATISTICS FOR 2016

Parameter (µgm ⁻³)	Mean	Max	Min	% Recovery	Notes
PM Coarse	100.62	15,578	-61.4	74.3%	
PM ₁₀ local	114.4	16,606	-59.8	74.3%	
PM ₁₀ STP	44.59	4,109	-21.91	30.8%	
PM _{2.5}	13.72	1,206	-25.5	74.3%	

TABLE 10. SALTON SEA PARK PARTICULATE DATA STATISTICS FOR 2016

Parameter (μgm^{-3})	Mean	Max	Min	% Recovery	Notes
PM Coarse	11.95	140.87	-6.33	1.67%	
PM ₁₀ local	16.35	167.34	-7.29	1.67%	
PM ₁₀ STP	10.47	23.16	-5.59	0.11%	
PM _{2.5}	4.4	29.13	-9.93	1.67%	

TABLE 11. SONNY BONO PARTICULATE DATA STATISTICS FOR 2016

Parameter (μgm^{-3})	Mean	Max	Min	% Recovery	Notes
PM Coarse	43.68	7,999	-51.3	78.4%	Sudden high loading during a dust storm caused the TEOM to return a "max-out" value of 7999; the same event also caused recovery oscillations in the mass transducer leading to high negative values. Due to the circumstances the data were not invalidated.
PM ₁₀ local	50.83	7,999	-58.7	78.4%	See note above
PM ₁₀ STP	40.19	3,047	-15.31	22.3%	
PM _{2.5}	7.35	1,380	-24.7	78.4%	

TABLE 12. TORRES MARTINEZ PARTICULATE DATA STATISTICS FOR 2016

Parameter (μgm^{-3})	Mean	Max	Min	% Recovery	Notes
PM Coarse	24.61	2,878	-19.1	92.2%	
PM ₁₀ local	30.04	3,104	-13.66	92.2%	
PM ₁₀ STP	22.26	1,233	-13.82	37.0%	
PM _{2.5}	5.42	625.53	-10.8	92.2%	

1.3 2016 ERRATA AND NOTES

The following errata and notes are pertinent to the 2016 datasets:

- There are relative humidity measurements at 2m during 2016 Q1 and Q3 at Bombay Beach, 2016 Q1 and Q2 at Salton Sea Park, and 2016 Q1, Q2, and Q3 at Torres Martinez which are greater than 100%. According to the QAPP, "the humidity range of the humidity sensor is from 0-100 percent with an accuracy of ± 0.8 percent when the temperature is at 23°C." However,

the instruments do drift as they age (up to 1% per year). In addition, the EPA audit tolerance is 8%, so a drift below that will not be flagged for recalibration. After October 2016, the logger program forced the maximum to 100%, but the decision was made to leave values greater than 100% for older data based on the above.

- The wind direction measurements at 10m during 2016 Q1 at Sonny Bono do not span full range of 0-360 degrees. Additionally, there is a large gap data in collection (i.e. 2016 Q2 and 2016 Q3 data is missing). Given the full sonic invalidation at Sonny Bono for this time period, and given no other information available to us to invalidate the 10m wind direction (vane) data, the data for the first part of 2016 was retained. There isn't a full compass span for that limited time frame, approximately ~45 days, but the CARB audit on 2/24/2016 included the vane and indicated passing for all checks so it was presumed that the period 1/1/2016 to 2/24/2016 was valid. Wind direction failed the close-out audit on 10/3/2016 and so data were invalidated back to the last "known good" point, which was the CARB audit on 2/24/2016.
- When comparing the wind speed measurements at 1m and 2m, some instruments have a different lower cutoff value to reflect calm or still conditions. The minimum threshold was set inconsistently in the Ecotech system. The minimums for the older data were not standardized, but after October 2016 the logger program is consistent for 10m WS at all sites (1m and 2m WS were removed).
- For periods where data are missing, the QA/QC Level is denoted "No QAQC." This is because, strictly speaking, no QA was done for these periods since data were unrecoverable. However, the data should still be considered "final."
- The vacuum pressure during 2016 Q1 and Q2 at Bombay Beach, Sonny Bono, Salton City, and Torres Martinez appear to be anomalous (i.e. inconsistent with other data). It is believed this is due to a rounding issue with data coming from the Ecotech system.
- The PM_{2.5} mass transducer oscillator noise is essentially zero for most of 2016 Q1 and Q2 at Bombay Beach, Sonny Bono, and Torres Martinez. The data appears distinctly different than other data. This is most likely due to incorrect reporting by the Ecotech system and it wasn't prioritized for individual flagging during this time period in the review, but it was used as a diagnostic for validating TEOM data if there was reason to believe that the concentration data were suspect.
- The vacuum bypass flows 2016 Q1 at Sonny Bono appear to be anomalous (i.e. inconsistent with other data). These are from a data mapping problem from the Ecotech files: 144 is the status code and not the actual data. Similar to the oscillator noise, this parameter was not scrutinized individually as part of validating the TEOM concentrations for the older data and was left "as-is."

2 2017 DATA SUMMARY

2.1 2017 METEOROLOGICAL DATA HIGHLIGHTS

Basic summary statistics are presented below for each of the six meteorological stations that are part of the SSAQMN. There were no new major issues in 2017 other than the continuing problems with the net radiation sensors at some sites; these were replaced with solar radiation sensors at all six stations in December 2017.

TABLE 13. BOMBAY BEACH METEOROLOGICAL DATA STATISTICS FOR 2017

Parameter	Mean	Max	Min	% Recovery	Notes
Ambient Temperature (2m, °C)	24.47	46.1	3.76	99.0%	
Barometric Pressure (2m, atm)	NA	NA	NA	NA	Not measured at this station
Delta Temperature (°C)	0.5	7.02	-1.53	92.5%	
Net Radiation (Wm ⁻²)	72.16	497.8	-102.9	87.1%	
Precipitation (mm)	NA	NA	NA	NA	Not measured at this station
Relative Humidity (2m, %)	40.31	96.9	2.81	99.0%	
Solar Radiation (Wm ⁻²)	137.91	662.8	0	8.4%	Installed Dec. 2017
Sonic 2D WD (10m, deg)	NA	NA	NA	NA	Removed 10/4/16
Sonic 2D WS (10m, ms ⁻¹)	NA	NA	NA	NA	Removed 10/4/16
Wind Direction (10m, deg)		360	0.02	99.0%	
Wind Direction SD (10m, deg)	21.57	100.8	0.01	99.0%	
Wind speed (10m, ms ⁻¹)	3.21	18.73	0.01	99.0%	
Wind speed (1m, ms ⁻¹)	NA	NA	NA	NA	Removed 10/4/16
Wind speed (2m, ms ⁻¹)	NA	NA	NA	NA	Removed 10/4/16

TABLE 14. NAVAL TEST BASE METEOROLOGICAL DATA STATISTICS FOR 2017

Parameter	Mean	Max	Min	% Recovery	Notes
Ambient Temperature (2m, °C)	25.33	48.31	2.35	99.2%	
Barometric Pressure (2m, atm)	NA	NA	NA	NA	Not measured at this station
Delta Temperature (°C)	0.59	7.19	-1.4	94.1%	
Net Radiation (Wm ⁻²)				0.0%	Failed 2016 CARB audit and was not able to be recalibrated
Precipitation (mm)	NA	NA	NA	NA	Not measured at this station
Relative Humidity (2m, %)	33.28	99.5	2.88	99.2%	
Solar Radiation (Wm ⁻²)	129.29	637.7	0	13.0%	Installed Dec. 2017
Sonic 2D WD (10m, deg)	NA	NA	NA	NA	Removed 10/4/16
Sonic 2D WS (10m, ms ⁻¹)	NA	NA	NA	NA	Removed 10/4/16
Wind Direction (10m, deg)		360	0	99.2%	
Wind Direction SD (10m, deg)	22.15	98.6	1.03	99.2%	
Wind speed (10m, ms ⁻¹)	4.07	14.89	0.15	29.8%	Failed a routine audit and data were back-invalidated to the previous audit.
Wind speed (1m, ms ⁻¹)	NA	NA	NA	NA	Removed 10/4/16
Wind speed (2m, ms ⁻¹)	NA	NA	NA	NA	Removed 10/4/16

TABLE 15. SALTON CITY METEOROLOGICAL DATA STATISTICS FOR 2017

Parameter	Mean	Max	Min	% Recovery	Notes
Ambient Temperature (2m, °C)	24.66	47.18	2	99.0%	
Barometric Pressure (2m, atm)	NA	NA	NA	NA	Not measured at this station
Delta Temperature (°C)	0.57	7.13	-1.88	99.0%	
Net Radiation (Wm ⁻²)	72.46	468.9	-95.3	85.0%	
Precipitation (mm)	NA	NA	NA	NA	Not measured at this station
Relative Humidity (2m, %)	36.82	97.6	2.52	99.0%	
Solar Radiation (Wm ⁻²)	139.62	726.1	0	12.9%	Installed Dec. 2017
Sonic 2D WD (10m, deg)	NA	NA	NA	NA	Removed 10/4/16
Sonic 2D WS (10m, ms ⁻¹)	NA	NA	NA	NA	Removed 10/4/16
Wind Direction (10m, deg)		360	0	99.0%	
Wind Direction SD (10m, deg)	20.72	99.2	0	99.0%	
Wind speed (10m, ms ⁻¹)	3.35	18.22	0	99.0%	
Wind speed (1m, ms ⁻¹)	NA	NA	NA	NA	Removed 10/4/16
Wind speed (2m, ms ⁻¹)	NA	NA	NA	NA	Removed 10/4/16

TABLE 16. SALTON SEA PARK METEOROLOGICAL DATA STATISTICS FOR 2017

Parameter	Mean	Max	Min	% Recovery	Notes
Ambient Temperature (2m, °C)	24.28	44.76	4.34	99.2%	
Barometric Pressure (2m, atm)	NA	NA	NA	NA	Not measured at this station
Delta Temperature (°C)	0.81	7.38	-2.1	99.2%	
Net Radiation (Wm ⁻²)	88.63	601.9	-101.1	93.6%	
Precipitation (mm)	NA	NA	NA	NA	Not measured at this station
Relative Humidity (2m, %)	38.95	97.8	3.2	99.2%	
Solar Radiation (Wm ⁻²)	132.02	613.9	0	4.75%	Installed Dec. 2017
Sonic 2D WD (10m, deg)	NA	NA	NA	NA	Removed 10/4/16
Sonic 2D WS (10m, ms ⁻¹)	NA	NA	NA	NA	Removed 10/4/16
Wind Direction (10m, deg)		359.9	0.01	99.2%	
Wind Direction SD (10m, deg)	26.41	101.1	3.03	99.2%	
Wind speed (10m, ms ⁻¹)	2.25	10.29	0.09	99.2%	
Wind speed (1m, ms ⁻¹)	NA	NA	NA	NA	Removed 10/4/16
Wind speed (2m, ms ⁻¹)	NA	NA	NA	NA	Removed 10/4/16

TABLE 17. SONNY BONO METEOROLOGICAL DATA STATISTICS FOR 2017

Parameter	Mean	Max	Min	% Recovery	Notes
Ambient Temperature (2m, °C)	23.86	48.47	0.68	96.7%	
Barometric Pressure (2m, atm)	1.01	1.03	0.99	93.2%	
Delta Temperature (°C)	0.53	7.79	-2.45	93.9%	
Net Radiation (Wm ⁻²)				0.0%	Failed 2016 CARB audit and was not able to be recalibrated
Precipitation (mm)	0	2.3	0	96.7%	
Relative Humidity (2m, %)	49.73	100	5.93	96.7%	
Solar Radiation (Wm ⁻²)	133	628.3	0	8.87%	Installed Dec. 2017
Sonic 2D WD (10m, deg)	NA	NA	NA	NA	Removed 10/4/16
Sonic 2D WS (10m, ms ⁻¹)	NA	NA	NA	NA	Removed 10/4/16
Wind Direction (10m, deg)		360	0.03	96.7%	
Wind Direction SD (10m, deg)	22.31	100	2.51	96.7%	
Wind speed (10m, ms ⁻¹)	3.17	15.94	0.13	96.7%	
Wind speed (1m, ms ⁻¹)	NA	NA	NA	NA	Removed 10/4/16
Wind speed (2m, ms ⁻¹)	NA	NA	NA	NA	Removed 10/4/16

TABLE 18. TORRES MARTINEZ METEOROLOGICAL DATA STATISTICS FOR 2017

Parameter	Mean	Max	Min	% Recovery	Notes
Ambient Temperature (2m, °C)	20.23	48.29	-0.51	73.5%	
Barometric Pressure (2m, atm)	NA	NA	NA	NA	Not measured at this station
Delta Temperature (°C)	0.84	8.83	-1.58	98.4%	
Net Radiation (Wm ⁻²)				0.0%	Failed 2016 CARB audit and was not able to be recalibrated
Precipitation (mm)	0.01	10.4	0	98.4%	
Relative Humidity (2m, %)	43.22	97.5	4.06	91.0%	
Solar Radiation (Wm ⁻²)	129.22	606.2	0	4.7%	Installed Dec. 2017
Sonic 2D WD (10m, deg)	NA	NA	NA	NA	Removed 10/4/16
Sonic 2D WS (10m, ms ⁻¹)	NA	NA	NA	NA	Removed 10/4/16
Wind Direction (10m, deg)		360	0.01	98.4%	
Wind Direction SD (10m, deg)	23.23	100.3	3.16	98.4%	
Wind speed (10m, ms ⁻¹)	2.87	11.23	0.12	98.4%	
Wind speed (1m, ms ⁻¹)	NA	NA	NA	NA	Removed 10/4/16
Wind speed (2m, ms ⁻¹)	NA	NA	NA	NA	Removed 10/4/16

2.2 2017 PARTICULATE DATA HIGHLIGHTS

Many of the TEOMs experienced major repairs in 2017 due to the age of the instruments, which depressed data recovery. Notably the logic board and amplifier boards at Sonny Bono were replaced, which led to a back-invalidation of most of 2017 Q1, and Torres Martinez was offline for all of September 2017 while waiting for a part. In addition, PM₁₀ STP calculations resumed and incorporated the use of the stand-alone pressure sensor at the Sonny Bono station in the event that the onboard TEOM pressure sensor failed.

TABLE 19. BOMBAY BEACH PARTICULATE DATA STATISTICS FOR 2017

Parameter (μgm^{-3})	Mean	Max	Min	% Recovery	Notes
PM Coarse	21.23	3,934	-14.53	95.4%	
PM ₁₀ local	25.9	4,055	-14.21	95.4%	
PM ₁₀ STP	25.85	3,957	-14.6	95.4%	
PM _{2.5}	4.67	135.6	-12.61	95.4%	

TABLE 20. NAVAL TEST BASE PARTICULATE DATA STATISTICS FOR 2017

Parameter (μgm^{-3})	Mean	Max	Min	% Recovery	Notes
PM Coarse	37.46	5,562	-16.34	94.2%	
PM ₁₀ local	44.5	5,922	-14.75	94.2%	
PM ₁₀ STP	44.84	5,951	-14.67	94.2%	
PM _{2.5}	7.06	360	-14.61	94.2%	

TABLE 21. SALTON CITY PARTICULATE DATA STATISTICS FOR 2017

Parameter (μgm^{-3})	Mean	Max	Min	% Recovery	Notes
PM Coarse	56.8	7,999	-16.66	94.0%	Sudden high loading during a dust storm caused the TEOM to return a "max-out" value of 7999. Due to the circumstances the data were not invalidated.
PM ₁₀ local	65.38	7,999	-14.72	94.0%	See note above
PM ₁₀ STP	65.41	7,963	-14.67	94.0%	
PM _{2.5}	8.77	572.1	-13.48	94.0%	

TABLE 22. SALTON SEA PARK PARTICULATE DATA STATISTICS FOR 2017

Parameter (μgm^{-3})	Mean	Max	Min	% Recovery	Notes
PM Coarse	18.1	990	-14.57	83.2%	
PM ₁₀ local	23.35	1,099	-14.74	83.2%	
PM ₁₀ STP	23.24	1,096	-15.04	83.2%	
PM _{2.5}	5.25	157.9	-13.52	83.2%	

TABLE 23. SONNY BONO PARTICULATE DATA STATISTICS FOR 2017

Parameter (μgm^{-3})	Mean	Max	Min	% Recovery	Notes
PM Coarse	36.13	1,119	-19.07	70.3%	
PM ₁₀ local	43.87	1,164	-14.89	70.3%	
PM ₁₀ STP	43.62	1,165	-14.99	70.3%	
PM _{2.5}	7.74	247.2	-14.85	70.3%	

TABLE 24. TORRES MARTINEZ PARTICULATE DATA STATISTICS FOR 2017

Parameter (μgm^{-3})	Mean	Max	Min	% Recovery	Notes
PM Coarse	29.06	6,611	-14.48	76.2%	
PM ₁₀ local	35.1	6,803	-14.6	76.2%	
PM ₁₀ STP	35.03	6,730	-14.63	76.2%	
PM _{2.5}	6.05	191.7	-12.14	76.2%	

2.3 2017 ERRATA AND NOTES

The following errata and notes are pertinent to the 2017 datasets:

- The PM_{2.5} mass accumulations are negative during 2017 Q3 at Salton City and 2017 Q1, Q2 and Q3 at Salton Sea Park. This correlates with brief (1-hour) periods where the TEOM calculates a negative concentration due to an instability in the instrument. This does not invalidate the concentration data (other than the brief period of extreme negative concentration) since the concentration data is a different calculation stream than the mass accumulation. High relative humidity can contribute to this and an example of this occurred at Salton City in 2017. If the incoming PM is hydrated, sticks to the filter, and then dries after a brief period, it will destabilize the calculations for that hour, and since the calculation is simply a subtraction from the previous

hour, the instrument can end up with negative mass. According to Thermo Scientific, the manufacturer of the TEOMs, brief power interruptions can also affect this calculation.

- The vacuum bypass flows during 2017 Q2 at Naval Test Base appear to be anomalous (i.e. inconsistent with other data). This period of "jitter" in 2017 corresponds to a period with a number of errors and site visits, including an audit where the flows were adjusted, but were still within tolerance (12 l/min +/- 5%).

3 SUMMARY STATISTICS 2010–2017

The annual percent data recovery by station and parameter are summarized in the table below.

TABLE 25. RUNNING SUMMARY OF DATA RECOVERY SINCE THE NETWORK WAS INSTALLED

Bombay Beach (BB)											
Year	WS 1M	WS 2M	WS 10M	Diff Temp	AT 2m	RH 2m	Net Rad ^β	WD 10m ^λ	Precip	BP 2m	PM ₁₀ Local
2010 ^δ	99.4%	99.4%	99.0%	99.3%	99.4%	99.4%	98.9%	99.4%	NA	NA	75.0%
2011	99.4%	88.6%	91.9%	95.8%	99.4%	96.5%	95.8%	99.4%	NA	NA	43.5%
2012	99.6%	59.1%	99.6%	35.3%	99.6%	99.6%	98.2%	92.9%	NA	NA	64.1%
2013	35.4%	98.9%	95.7%	36.5%	98.9%	98.9%	98.9%	71.4%	NA	NA	91.5%
2014	66.7%	98.2%	96.8%	98.3%	98.2%	98.2%	98.3%	63.2%	NA	NA	75.8%
2015 ^α	98.8%	98.8%	98.8%	98.1%	98.8%	97.7%	98.1%	59.0%	NA	NA	70.4%
2016	70.2%	70.2%	92.2%	22.0%	36.8%	92.1%	11.0%	89.6%	NA	NA	88.3%
2017	NA	NA	99.0%	92.5%	99.0%	99.0%	87.1%	99.0%	NA	NA	95.4%
Overall	71.2%	76.7%	96.6%	72.2%	91.3%	97.7%	85.8%	84.2%	NA	NA	75.5%
Naval Test Base (NTB)											
Year	WS 1M	WS 2M	WS 10M	Diff Temp	AT 2m	RH 2m	Net Rad ^β	WD 10m ^λ	Precip	BP 2m	PM ₁₀ Local
2010 ^δ	99.1%	99.1%	98.9%	99.1%	99.1%	99.1%	98.0%	99.1%	NA	NA	88.0%
2011	99.2%	99.2%	80.9%	99.2%	99.2%	99.2%	99.2%	97.3%	NA	NA	91.9%
2012	86.2%	91.6%	85.2%	90.5%	99.3%	99.3%	90.2%	97.7%	NA	NA	82.1%
2013	96.9%	96.2%	89.2%	95.9%	96.9%	96.9%	93.7%	62.5%	NA	NA	63.1%
2014	90.5%	92.5%	93.8%	97.2%	97.2%	97.2%	97.2%	81.7%	NA	NA	85.5%
2015 ^α	73.0%	95.3%	95.3%	94.5%	95.3%	95.3%	95.2%	95.4%	NA	NA	92.7%
2016	60.6%	68.6%	89.0%	17.6%	31.3%	88.9%	0.0%	67.1%	NA	NA	86.0%
2017	NA	NA	29.8%	94.1%	99.2%	99.2%	0.0%	99.2%	NA	NA	93.8%
Overall	75.7%	80.3%	82.8%	86.0%	89.7%	96.9%	71.7%	87.5%	NA	NA	85.4%
Salton City (SC)											
Year	WS 1M	WS 2M	WS 10M	Diff Temp	AT 2m	RH 2m	Net Rad ^β	WD 10m ^λ	Precip	BP 2m	PM ₁₀ Local
2010 ^δ	91.6%	93.4%	92.2%	93.4%	93.4%	93.4%	90.7%	93.4%	NA	NA	80.9%
2011	55.8%	69.6%	81.4%	81.9%	81.9%	81.9%	74.4%	82.5%	NA	NA	73.3%
2012	23.5%	40.8%	45.7%	46.8%	46.8%	46.8%	31.9%	91.1%	NA	NA	31.9%
2013	38.8%	79.9%	84.4%	85.7%	86.6%	86.6%	22.8%	57.3%	NA	NA	47.5%
2014	45.1%	72.8%	80.5%	80.5%	80.5%	72.0%	80.5%	71.8%	NA	NA	52.2%
2015 ^α	73.4%	91.8%	91.8%	91.7%	91.8%	91.7%	91.6%	42.2%	NA	NA	86.1%
2016	25.8%	25.8%	82.3%	21.7%	82.3%	82.3%	82.3%	61.3%	NA	NA	74.3%
2017	NA	NA	99.0%	99.0%	99.0%	99.0%	85.0%	99.0%	NA	NA	93.0%
Overall	44.3%	59.3%	82.2%	75.1%	82.8%	81.7%	69.9%	74.8%	NA	NA	67.4%

SALTON SEA - AMBIENT AIR QUALITY MONITORING NETWORK 2016-2017 DATA REVIEW

Salton Sea Park (SSP)											
Year	WS 1M	WS 2M	WS 10M	Diff Temp	AT 2m	RH 2m	Net Rad ^β	WD 10m ^λ	Precip	BP 2m	PM ₁₀ Local
2010 ^δ	97.8%	97.8%	97.8%	97.8%	97.8%	97.8%	95.0%	97.8%	NA	NA	83.0%
2011	92.1%	92.1%	80.4%	92.1%	92.1%	92.1%	85.3%	68.5%	NA	NA	87.2%
2012	99.6%	99.6%	99.6%	76.4%	99.6%	99.6%	71.5%	99.0%	NA	NA	64.4%
2013	94.2%	94.2%	94.2%	94.1%	94.2%	94.2%	85.1%	85.1%	NA	NA	86.4%
2014	85.2%	85.2%	85.2%	99.2%	92.0%	99.2%	91.1%	86.2%	NA	NA	83.6%
2015 ^α	92.4%	95.6%	95.6%	95.7%	95.6%	95.6%	95.7%	73.9%	NA	NA	85.8%
2016	71.4%	71.4%	71.5%	0.10%	14.9%	96.2%	91.4%	76.7%	NA	NA	1.67%
2017	NA	NA	99.2%	99.2%	99.2%	99.2%	93.6%	99.2%	NA	NA	82.6%
Overall	79.1%	79.5%	90.4%	81.8%	85.7%	96.7%	88.6%	85.8%	NA	NA	71.8%
Sonny Bono (SB)											
Year	WS 1M	WS 2M	WS 10M	Diff Temp	AT 2m	RH 2m	Net Rad ^β	WD 10m ^λ	Precip	BP 2m	PM ₁₀ Local
2010 ^δ	0.0%	0.0%	0.0%	97.5%	97.8%	97.8%	96.0%	99.2%	NA	NA	82.4%
2011	0.0%	0.0%	0.0%	98.8%	97.9%	89.7%	98.8%	98.9%	NA	NA	66.2%
2012	0.0%	0.0%	0.0%	14.9%	53.6%	56.3%	68.5%	88.8%	NA	NA	87.8%
2013	0.0%	0.0%	0.0%	66.9%	84.4%	89.6%	86.9%	92.0%	NA	NA	87.5%
2014	0.0%	0.0%	0.0%	65.4%	65.8%	65.8%	65.7%	76.6%	NA	NA	46.4%
2015 ^α	0.0%	0.0%	0.0%	24.3%	24.3%	24.3%	24.3%	25.9%	NA	NA	29.4%
2016	72.0%	72.0%	95.8%	23.9%	95.8%	95.8%	0.0%	41.7%	NA	NA	78.4%
2017	NA	NA	96.7%	93.9%	96.7%	96.7%	0.0%	96.7%	96.7%	93.2%	69.6%
Overall	9.0%	9.0%	24.1%	60.7%	77.0%	77.0%	55.0%	77.5%	96.7%	93.2%	68.5%
Torres-Martinez (TM)											
Year	WS 1M	WS 2M	WS 10M	Diff Temp	AT 2m	RH 2m	Net Rad ^β	WD 10m ^λ	Precip	BP 2m	PM ₁₀ Local
2010 ^δ	71.9%	71.9%	71.8%	71.7%	71.8%	71.8%	40.6%	71.9%	NA	NA	58.2%
2011	91.0%	91.0%	91.0%	91.0%	91.0%	91.0%	82.7%	91.0%	NA	NA	4.7%
2012	89.3%	89.3%	89.3%	84.0%	89.3%	89.3%	43.7%	88.6%	NA	NA	20.4%
2013	94.1%	51.7%	94.1%	91.8%	94.1%	94.1%	1.3%	63.9%	NA	NA	49.7%
2014	82.7%	47.6%	97.4%	97.4%	97.4%	97.4%	84.8%	77.9%	NA	NA	90.0%
2015 ^α	97.9%	97.9%	97.9%	96.9%	91.7%	91.7%	96.9%	46.1%	NA	NA	88.2%
2016	24.4%	56.4%	75.5%	0.13%	94.8%	90.4%	0.0%	66.8%	NA	NA	92.2%
2017	NA	NA	98.4%	98.4%	73.5%	91.0%	0.0%	98.4%	98.4%	NA	76.9%
Overall	68.9%	63.2%	89.4%	78.9%	88.0%	89.6%	43.8%	75.6%	98.4%	NA	60.0%

^α 2015 did not undergo the same level of QA/QC as other years.

^β Net radiation sensors were replaced with solar radiation sensors in December 2017. See Section 2.1.

^λ Wind direction was measured by sonic anemometers until late 2016 when they were replaced with vanes. Recovery in 2016 combines sonic anemometer values with vane values. See Section 1.1.

^δ Data in 2010 was collected from February 1 to December 31.

4 GENERAL DATA REVIEW QA/QC METHODS

After monitored data is gathered and imported into the Salton Sea Air Quality Monitoring Program Data Portal (data portal), the Team follows a multi-level QA/QC process to meet data quality objectives. The Team utilizes automated data review procedures and the expertise of numerous technical staff to review and quality check data from the monitoring network.

The Salton Sea Air Quality Team's data review staff include: the field crews/monitoring personnel responsible for proper operation of the meteorological and air quality stations, other technical personnel with direct knowledge of the proper operation of the monitoring equipment and data gathered, and staff and senior-level database programmers and air quality scientists.

The Team's multi-stage data review QA/QC process is described below:

Data Review, Level 0: After data is transmitted to the Team and loaded into the data portal, it is assigned as Level 0 data. At this stage, data are available for simple plotting and tabulations to ensure that the data from the instruments are being recorded and properly transmitted to the Team. Any issues with the monitoring equipment can be quickly identified by members of the Team.

Data Review, Level 1: At this review stage, the Salton Sea Air Quality Team's technical staff review the data in the data portal to ensure that there are no missing data periods. If there are missing data periods, the staff consult with the field crews and database programmers to determine if the data is available (or can be directly downloaded from the station dataloggers) and can be uploaded to the data portal. If the Team cannot fill in the missing data periods, the data is flagged as missing and unrecoverable and is invalidated.

For the Level 1 reviews, the data is reviewed for completeness and general reasonableness and proposed invalidation flags are placed in the data portal to indicate potential data invalidations. In addition, the data reviewer ensures that documentation from site visits to the monitoring stations, including any audit/calibration activities, are entered in the data portal and are flagged so that data recorded during these activities can be invalidated.

Data Review, Level 2: At this review stage, senior-level scientists review the Level 1 data and accept/reject the proposed data invalidations from the Level 1 review. For the Level 2 review, the Level 1 data is reviewed to eliminate outlier/clearly anomalous data and to ensure that the data collected is of good quality.

First, the Level 1 data is output from the data portal into Microsoft Excel or other programs so that the data files can be visually inspected line-by-line. The Level 1 datafiles are reviewed to determine that the proposed data invalidation flags are correctly aligned with the data to be invalidated. Also, additional invalidation flags, not recorded during the Level 1 review, may be added as needed.

Second, any audit and calibration information is considered. If a particular instrument failed an audit or calibration during the data review period, data from the failed instrument/parameter is typically back invalidated to the most recent, previous passing audit or calibration.

After the review of the Level 1 data files, the Level 2 reviewer generates numerous graphical plots to visually inspect the data. The graphical plots are intended to display any clearly erroneous data that may have not have been flagged during the Level 1 review. In addition, the Level 2 reviewer relies on his/her knowledge of atmospheric and air pollution processes to determine if data may be suspect or erroneous and in need of invalidation. The data from the group of monitoring stations are reviewed collectively and on an individual station basis.

Meteorological Data: The following information is reviewed/considered for the data from the meteorological monitoring stations:

Wind Speed, Wind Direction, and Standard Deviation of Horizontal Wind Direction (sigma theta):

- Maximum and minimum daily wind speed values - minimum wind speeds should be greater than or equal to 0 and maximum winds should be explained by meteorological conditions.
- Maximum and minimum daily wind direction values - minimum wind directions should be greater than or equal to 0 degrees and maximum wind directions should be no more than 360 degrees.
- The data portal automatically flags the wind speed and direction data and outputs a warning review flag if data values are constant for more at least three hours. In these cases, the reviewer is to determine if the data is valid/invalid. Some examples where data might be considered invalid might consist of an unchanging wind data due to instrument damage (i.e., a wind vane being damaged, a frozen anemometer, bearings issues with the equipment causing it not to move, etc.).
- Standard deviation of horizontal wind direction values - minimum sigma theta values should be greater than or equal to 0 degrees and it is the Team's experience that maximum sigma theta values are generally around about 90 - 100 degrees; however, sigma theta values greater than 100 degrees can and do occur and can be explained by wind vane meander under very low wind speed conditions. If there are some higher values or clear outliers, the sigma theta data are reviewed further in the context of the associated meteorological conditions to make a valid/invalid determination.

Ambient Temperature and Relative Humidity:

- Maximum and minimum daily data values are reviewed to ensure the data is reasonable given expected climatological normals.
- Diurnal patterns are reviewed to determine if the minimum temperature occurs in morning, and the maximum temperature occurs in the afternoon; if this pattern is not present, further analysis of recent cold front passages, stormy conditions/clouds, etc. are reviewed to explain the data further.

Delta Temperature (10-meter temperature minus 2-meter temperature):

- Diurnal patterns are reviewed - typical pattern is negative values (or weak positive values) in the daytime when the surface is generally warmer than the air above it (i.e., 2-meter temp. > 10-meter temp.) and positive values in the nighttime when the surface is colder than the air above it (i.e., 10-meter temp. > 2-meter temp. – nighttime atmospheric inversion).

Net Radiation:

- Maximum and minimum daily data values are reviewed to ensure the data is reasonable given expected climatological normals.
- Diurnal patterns are reviewed to determine if the minimum net radiation value occurs overnight (and are negative), and the maximum net radiation value occurs during the daytime; if this pattern is not present, further analysis of stormy conditions/clouds, etc. are reviewed to explain the data further.

Meteorological Data (Sonic Anemometer): Prior to the Team’s operation of the meteorological and air quality stations starting in late 2016, the Salton Sea meteorological network also consisted of a sonic anemometer system at each of the six monitoring stations. After the Team took over the stations, the sonic anemometer systems were discontinued.

The Team has reviewed the previously-collected sonic anemometer data from January 1, 2016 until late 2016 in the event the data can be used for future modeling and analysis purposes. It was important to preserve as much of the sonic data as possible (wind direction in particular). Prior to the Team’s operation of the stations, the meteorological network was not configured to gather wind direction data from a conventional wind vane; with the exception of Sonny Bono, wind direction data was only gathered from the sonic anemometer.

The following is a summary of the Team’s data review of the sonic anemometer data for 2016:

- Data invalidation flagging was made mostly consistent with the SSAQMN (i.e., Data Check Notes) data review logs that were compiled by the network operator from January to September 2016 and this information was supplemented with additional invalidations were needed.
- Consistent with the Data Check Notes, all periods with a Young Error (an error code self-reported by the sonic anemometer) greater than zero were invalidated for all sonic anemometer parameters.
- All azimuth wind directions were invalidated for 2016. Per the Team’s review of this data, the northerly wind directions were missing so that wind directions didn’t span a full 360 degrees, resulting in incomplete wind roses. In lieu of the azimuth wind direction data, future data users could potentially use the available 2-D wind direction data.
- Given data issues at Sonny Bono from January 1 to April 22, 2016, the following parameters were invalidated by the Team: 2-D and 3-D vector average wind directions (wind directions

didn't span a full 360 degrees; missing from the north), 2-D and 3-D vector average wind speeds, and 2-D and 3-D sigma theta values.

- Erroneous vertical wind components greater than around 1 meter per second were invalidated. There were many instances in the data sets where the vertical wind component was highly erroneous/anomalous and spiked starting around hour 00:00 and then slowly dropped back to baseline over the course of a few days. The Team cleaned up and invalidated the suspected erroneous data as much as possible, but the Team has little confidence in the data for this parameter and doesn't plan on using this data in future work.
- A few erroneous sonic anemometer temperature values were invalidated.

Particulate Data: The following general information is reviewed/considered for the data from the air quality (TEOM) monitoring stations:

Particulate concentration data (PM_{2.5}, PM₁₀ local conditions, PM₁₀ STP, PM Coarse):

- Particulate concentrations are reviewed - the higher concentration values are usually explained by high winds. In some cases, local activities or forest fire influences can explain the higher concentrations.
- In general, the PM concentrations are not invalidated unless there is a strong reason to do so. Possible reasons for invalidation might include significant/unreasonable data outliers (both strongly positive or negative), erroneous constant values such as 7999, values where the TEOM is indicating a status or operational mode error and the values are stuck at constant values, etc.
- Based on conversations with Thermo Scientific, the manufacturer of the TEOMs, the Team invalidates hourly PM concentrations less than $-15 \mu\text{g}/\text{m}^3$. In some selected instances when there is a very big dust event and very high PM concentration readings occur, as the TEOM stabilizes from the high mass loading, the Level 2-validated, post-dust event concentration data may contain a few PM concentrations less than $-15 \mu\text{g}/\text{m}^3$ and the Team might not invalidate these data.
- PM_{2.5} and PM₁₀ are reviewed concurrently for each station in the network to ensure that, in general, the PM₁₀ concentration data are greater than the PM_{2.5} concentration data.

Both relative humidity and temperature readings measured from the TEOM are reviewed in a similar fashion to the relative humidity and temperature readings from the meteorological station. Barometric pressure is also reviewed and is straightforward to review since atmospheric pressures should read around 1 atmosphere (atm).

5 REFERENCES

- Environmental Protection Agency. 2000. "Meteorological Monitoring Guidance for Regulatory Modeling Applications". EPA-454/R-99-005. February 2000.
<https://www3.epa.gov/scram001/guidance/met/mmgrma.pdf>. Accessed August 18, 2017.
- . 2007. "Guidance for Preparing Standard Operating Procedures (SOPs)". EPA/600/B-07/001. April 2007. <http://www.epa.gov/QUALITY/qs-docs/g6-final.pdf>. Accessed May 22, 2015.
- . 2013. "Quality Assurance Handbook for Air Pollution Measurement Systems: Volume II Ambient Air Quality Monitoring Program". EPA-454/B-13-003. May, 2013.
<https://www3.epa.gov/ttnamti1/files/ambient/pm25/qa/QA-Handbook-Vol-II.pdf>. Accessed August 18, 2017.
- . 2016a. "Guidance on the Development of Modeled Emission Rates for Precursors (MERPs) as a Tier 1 Demonstration Tool for Ozone and PM2.5 under the PSD Permitting Program." Memorandum from Richard A. Wayland, EPA Air Quality Assessment Division Director, to EPA Regional Air Division Directors, Regions 1-10, December 2.
- . 2016b. "Guidance on the Use of Models for Assessing the Impacts of Emissions from Single Sources on the Secondarily Formed Pollutants: Ozone and PM2.5." EPA-454/R-16-005. EPA Office of Air Quality Planning and Standards, Air Quality Assessment Division, December.
- . 2017. "Revision to the Guideline on Air Quality Models: Enhancements to the AERMOD Dispersion Modeling System and Incorporation of Approaches to Address Ozone and Fine Particulate Matter." 40 CFR Part 51, Appendix W. Docket ID No. EPA-HQ-OAR-2015-0310, January 17.