



San Joaquin Valley
AIR POLLUTION CONTROL DISTRICT

Technical Evaluation of Sensor Technology (TEST) Program

*Dylos Sensor
2019 – 4th Quarter*



Introduction and Sensor Profile

This analysis report is focused on assessing the performance of the Dylos DC1100 sensor as a part of the District's Technical Evaluation of Sensor Technology (TEST) Program. The Dylos sensor uses optical laser-based particle counting methodology to estimate the concentration of PM_{2.5} and PM₁₀. The Dylos sensor counts and measures the size of the individual particles to calculate a mass concentration.

Background and Approach of Evaluation Test

In May 2019, the District installed three Dylos sensors at the Clovis-Villa air monitoring station for the purpose of testing the Dylos sensors in the San Joaquin Valley and comparing the performance of the collocated Dylos sensors to the Federal Equivalent Method (FEM) PM_{2.5} analyzer. The data sets analyzed for this report compare PM_{2.5} data collected from the Dylos sensors and the MetOne BAM-1020 FEM monitor collocated at the regulatory air monitoring site. The scatter plots and time series graphs below show how the datasets compare for both hourly values and the 24-hour average.

Overview of Analysis Findings from Current Period

The analysis for this report covers the time period of October 2019 through December 2019 (2019 – 4th quarter). During this period, hourly data was removed from the calculation of bias when either the Dylos sensor or regulatory monitor did not have a valid hourly sample. For the 24-hour averages, only days with 18 or more valid hourly samples (75% or greater completeness) are included.

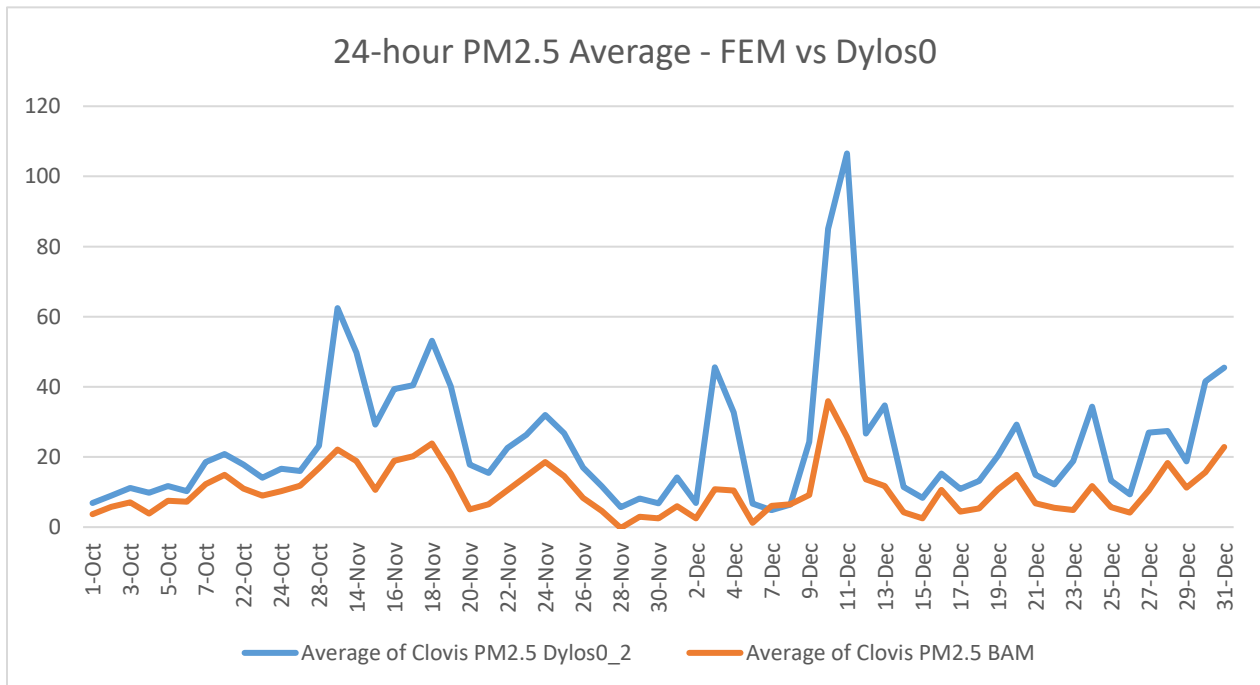
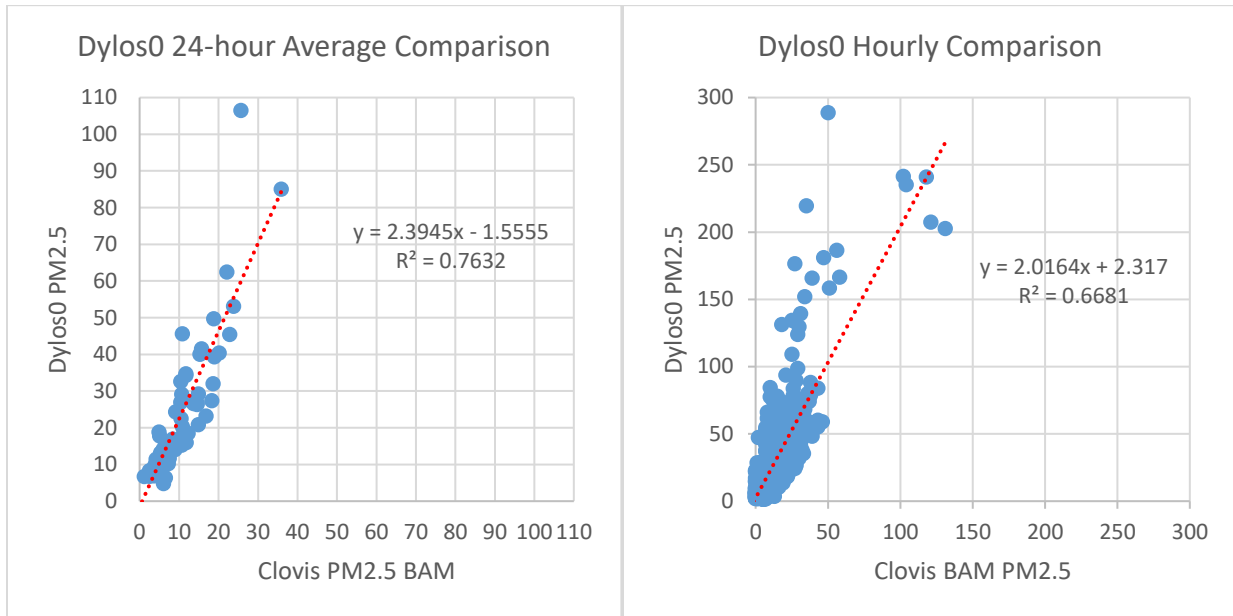
The 4th quarter of 2019 had variable conditions throughout the Valley. Concentrations during this period were impacted by a mixture of both troughs and ridges traversing the region. Elevated concentrations were observed in December around Christmas on both the Dylos sensors and the regulatory monitor while other concentrations in the period ranged from the Good AQI category to Unhealthy for Sensitive Groups AQI category.

Overall, the sensors operating during this period had high measured PM_{2.5} concentrations compared to the regulatory monitor. The Dylos1 had the lowest 24-hour bias, at 6.45 µg/m³, while Dylos0/2 had bias of 13.26 µg/m³ and 9.86 µg/m³ respectively.

Analysis of Clarity-Node Sensor Performance

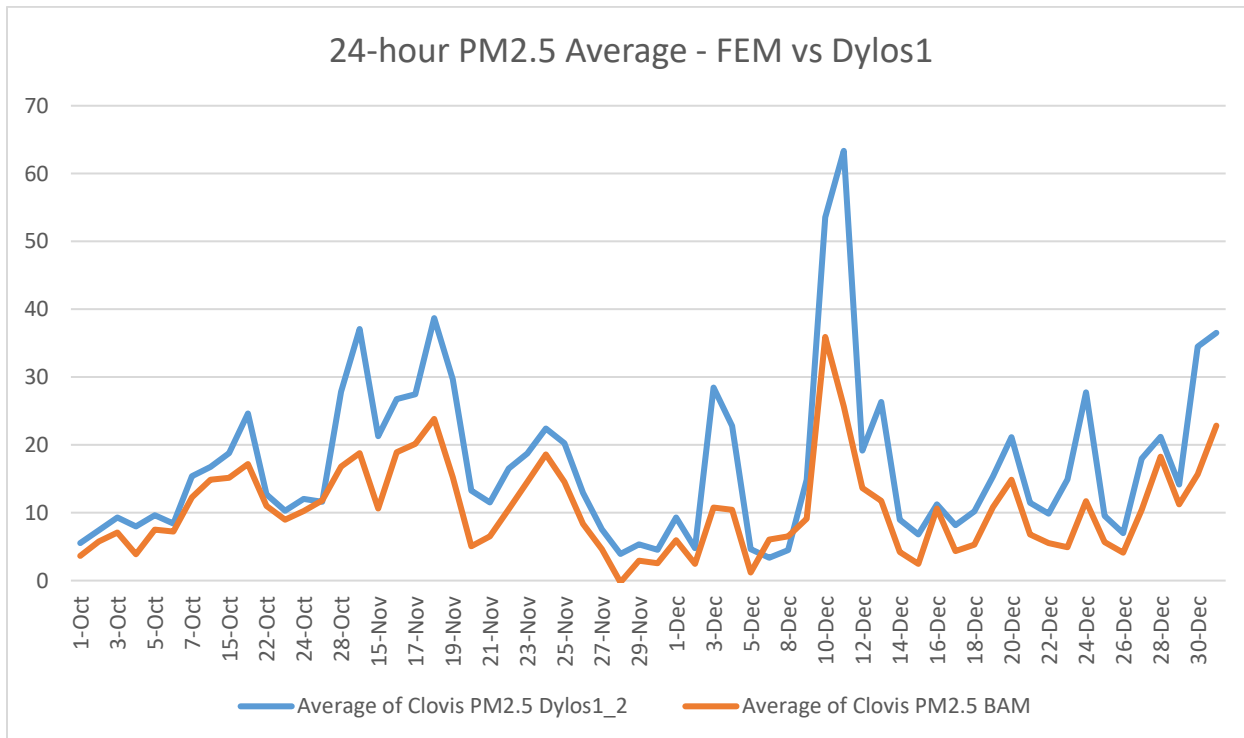
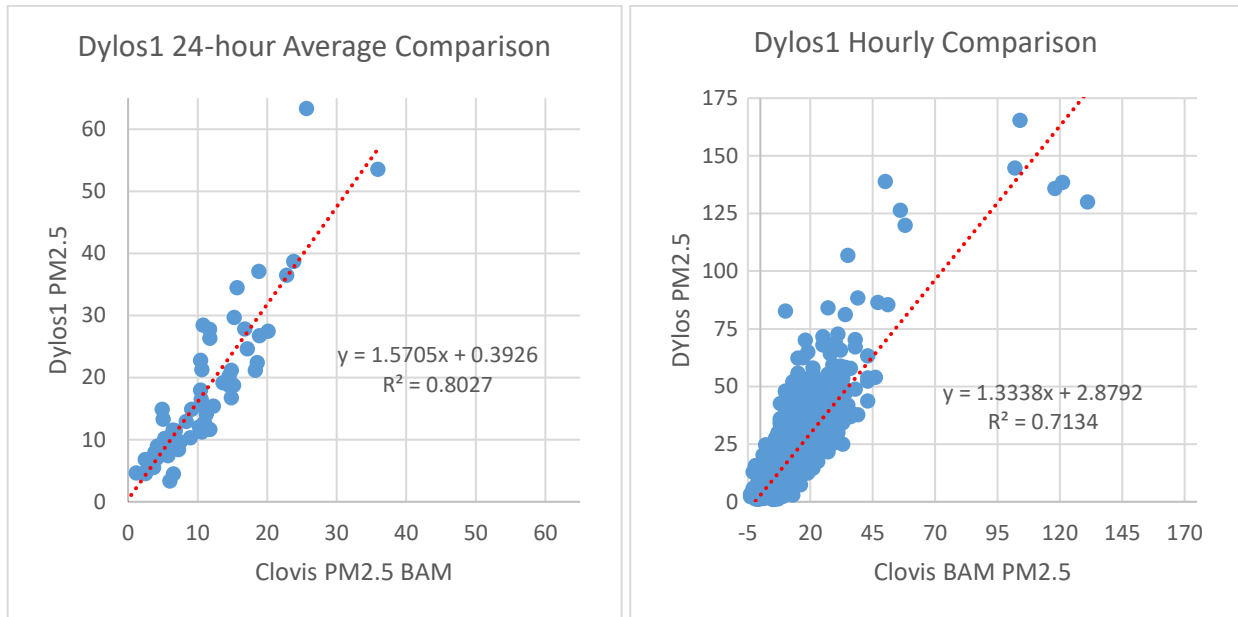
Dylos0

For the 24-hour average, Dylos data had a 13.26 $\mu\text{g}/\text{m}^3$ high bias during the November 2019 through December 2019 period. For the hourly average, Dylos data had a 12.86 $\mu\text{g}/\text{m}^3$ high bias over the same period.



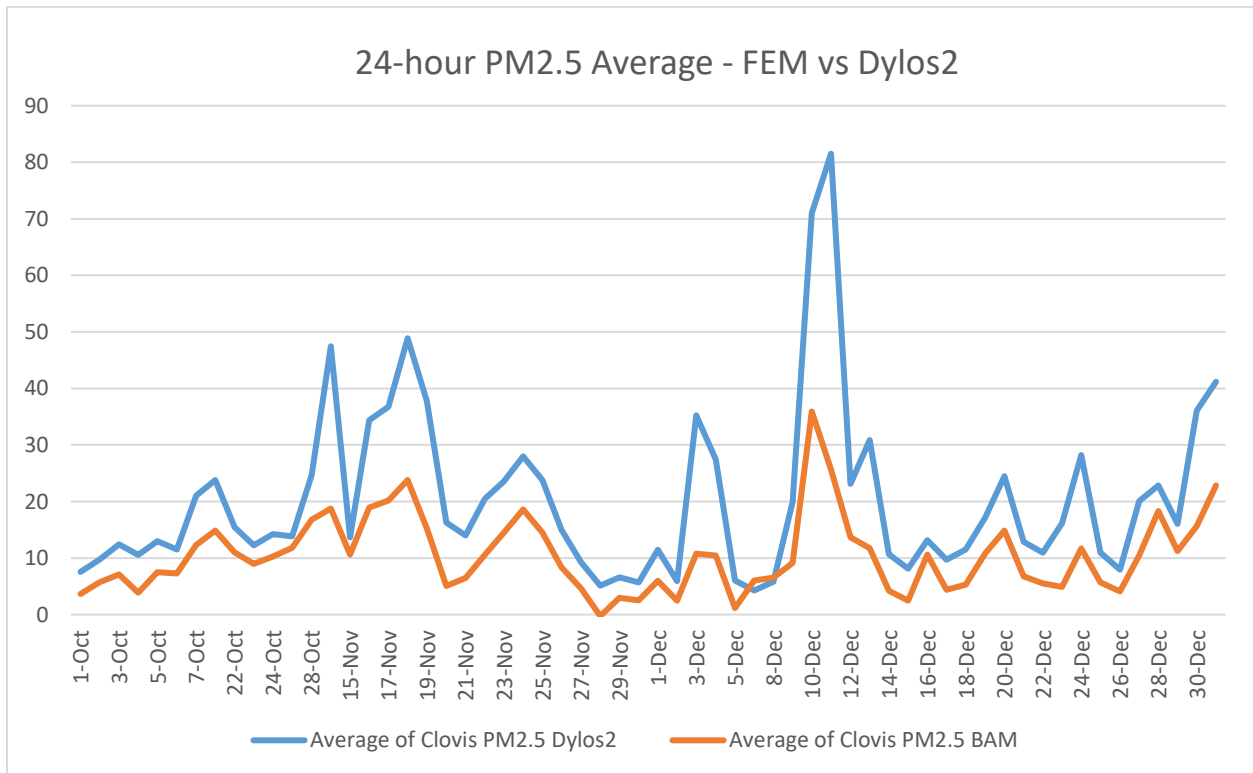
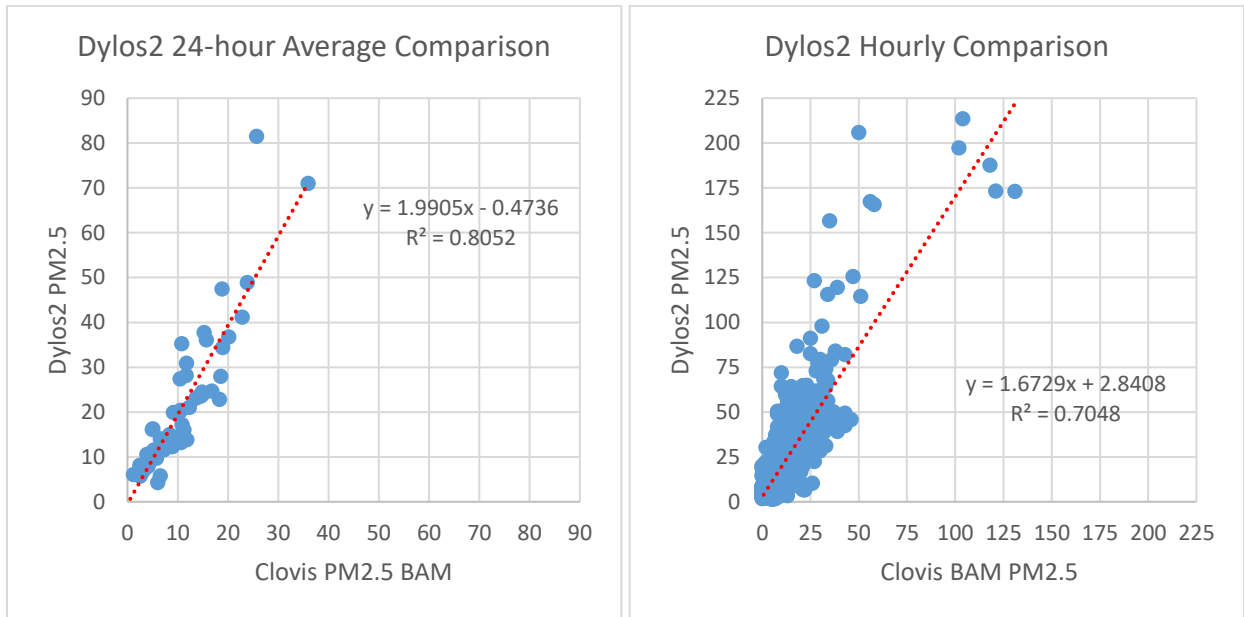
Dylos1

For the 24-hour average, Dylos data had a 6.45 µg/m³ high bias during the November 2019 through December 2019 period. For the hourly average, Dylos data had a 6.38 µg/m³ high bias over the same period.



Dylos2

For the 24-hour average, Dylos data had a 9.86 $\mu\text{g}/\text{m}^3$ high bias during the October 2019 through December 2019 period. For the hourly average, Dylos data had a 9.79 $\mu\text{g}/\text{m}^3$ high bias over the same period.



Statistical Summary

The following table provides a statistical summary of the PM_{2.5} data collected during the analysis period of this report.

Clovis-Villa	Average 24-hr	Max 1-hr	Max 24-hr	1-hr R2	1-hr Slope	1-hr Intercept	24-hr R2	24-hr Slope	24-hr Intercept
Dylos 0	23.68	288.91	106.55	0.67	2.02	2.32	0.76	2.39	-1.56
Dylos 1	17.01	165.36	63.35	0.71	1.33	2.88	0.80	1.57	0.39
Dylos 2	20.27	213.49	81.52	0.70	1.67	2.84	0.81	1.99	-0.47
FEM	12.32	131.00	131.00						