San Joaquin Valley
AIR POLLUTION CONTROL DISTRICT

Technical Evaluation of Sensor Technology (TEST) Program

Dylos Sensor
2021 – 2nd 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 PM2.5 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) PM2.5 analyzer. The data sets analyzed for this report compare PM2.5 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 April 2021 through June 2021 (2021 – 2nd 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.

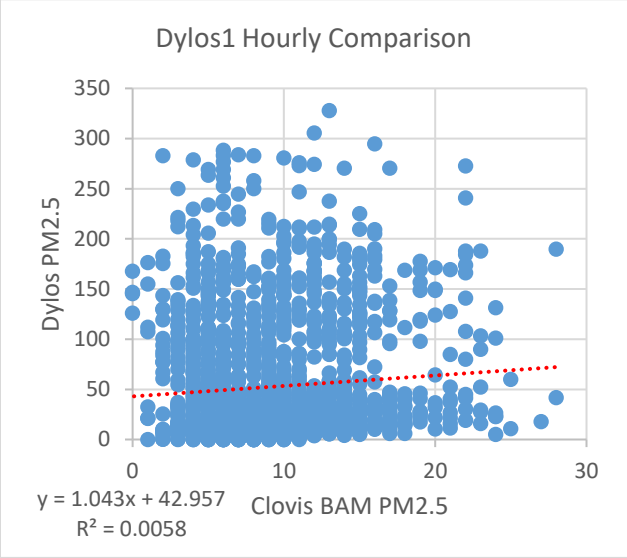
Seasonally, PM2.5 is typically highest during the winter months and lowest during the summer months. Weather systems can influence PM2.5 levels by either trapping pollutants near the surface or dispersing them. Generally, California's weather pattern is characterized by high pressure systems and low pressure systems that move through the region every two to four days in alternating fashion. As the 2nd quarter progressed, temperatures grew warmer and the high pressure systems that built over the region rendered stronger stability, particularly during the end of May-beginning of June and mid-June time frames. The low pressure systems that passed through brought good dispersion to the area yet only one of them delivered precipitation to the Valley, and small amounts at that. As such, conditions across the Valley were quite dry by the end of the 2nd quarter.

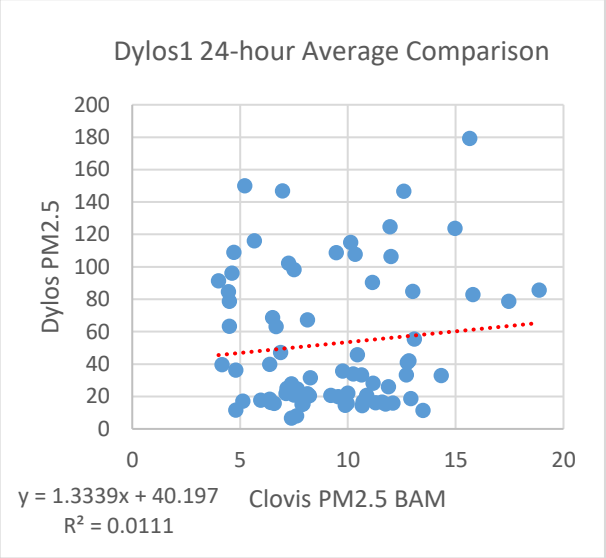
Overall, the sensors operating during this period had high results compared to the regulatory monitors. The Dylos1 had the lowest 24-hour bias at 9.07 $\mu g/m^3$, while sensors 0 & 2 had bias of 43.29 $\mu g/m^3$ and 11.73 $\mu g/m^3$ respectively.

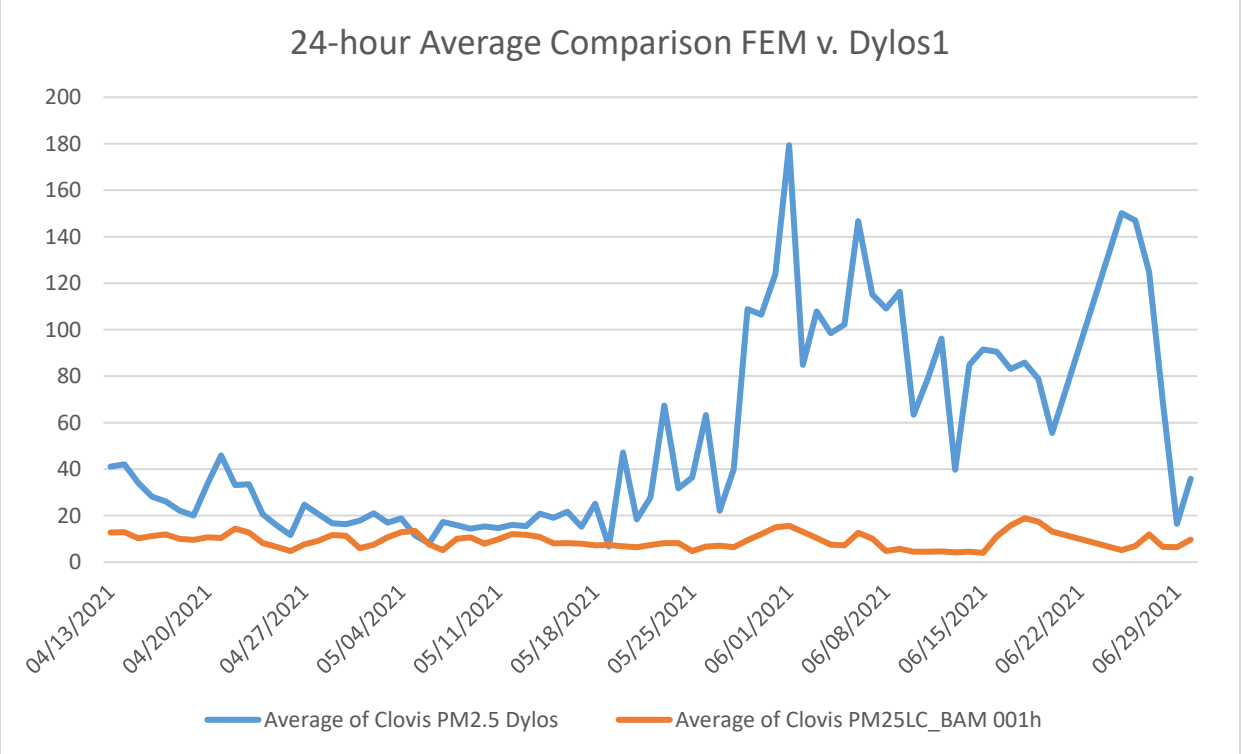
Analysis of Dylos Sensor Performance

Dylos 1

For the 24-hour average, Dylos data had a 43.29µg/m^3 high bias during the April 2021 through June 2021 period. For the hourly average, Dylos data had a 43.37 µg/m^3 high bias over the same period.

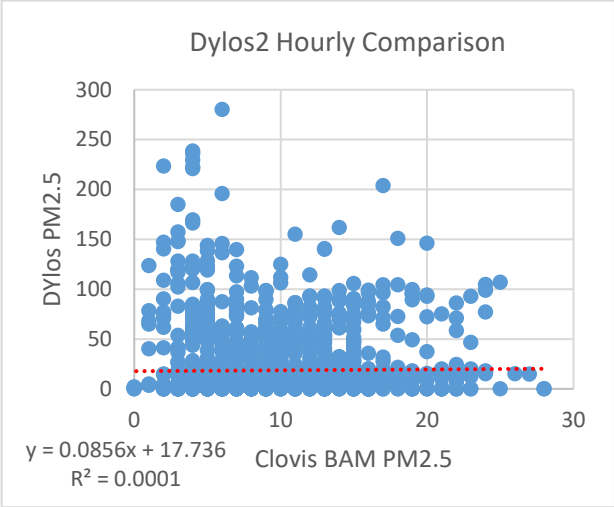


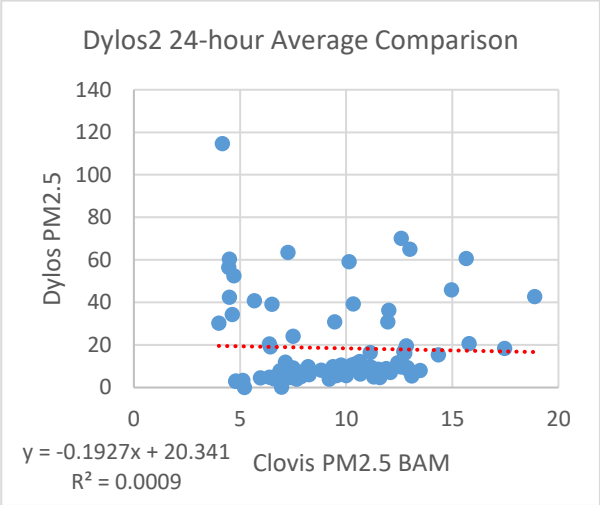


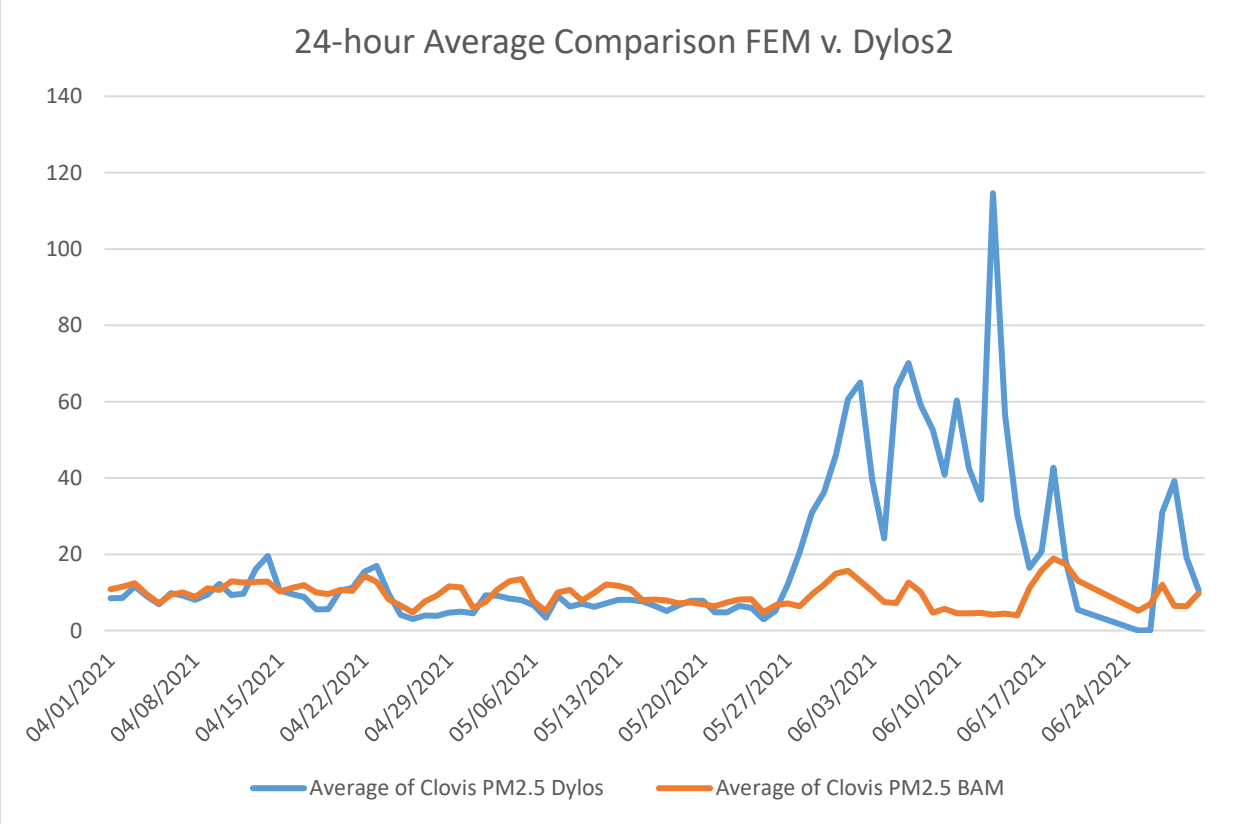


Dylos 2

For the 24-hour average, Dylos data had a 9.07 µg/m^3 high bias during April 2021 through June 2021 period. For the hourly average, Dylos data had a 9.14 µg/m^3 high bias over the same period.

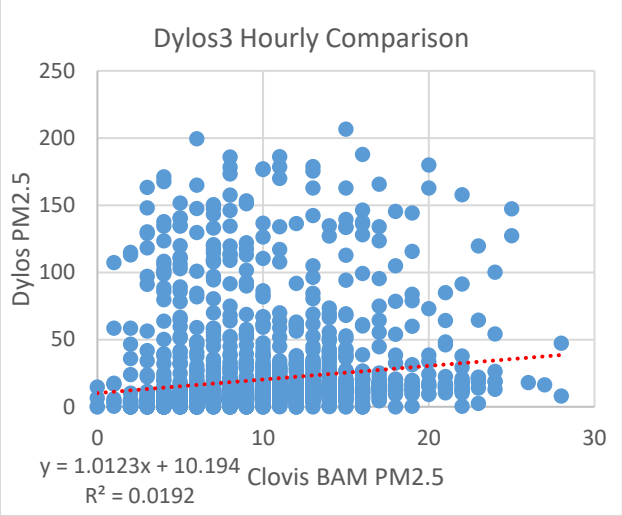


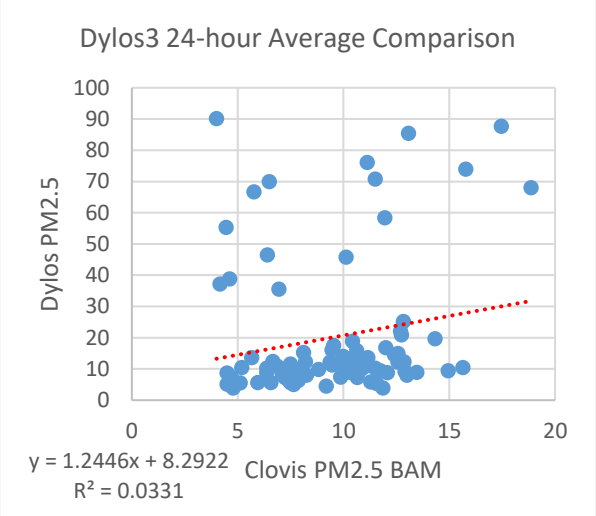


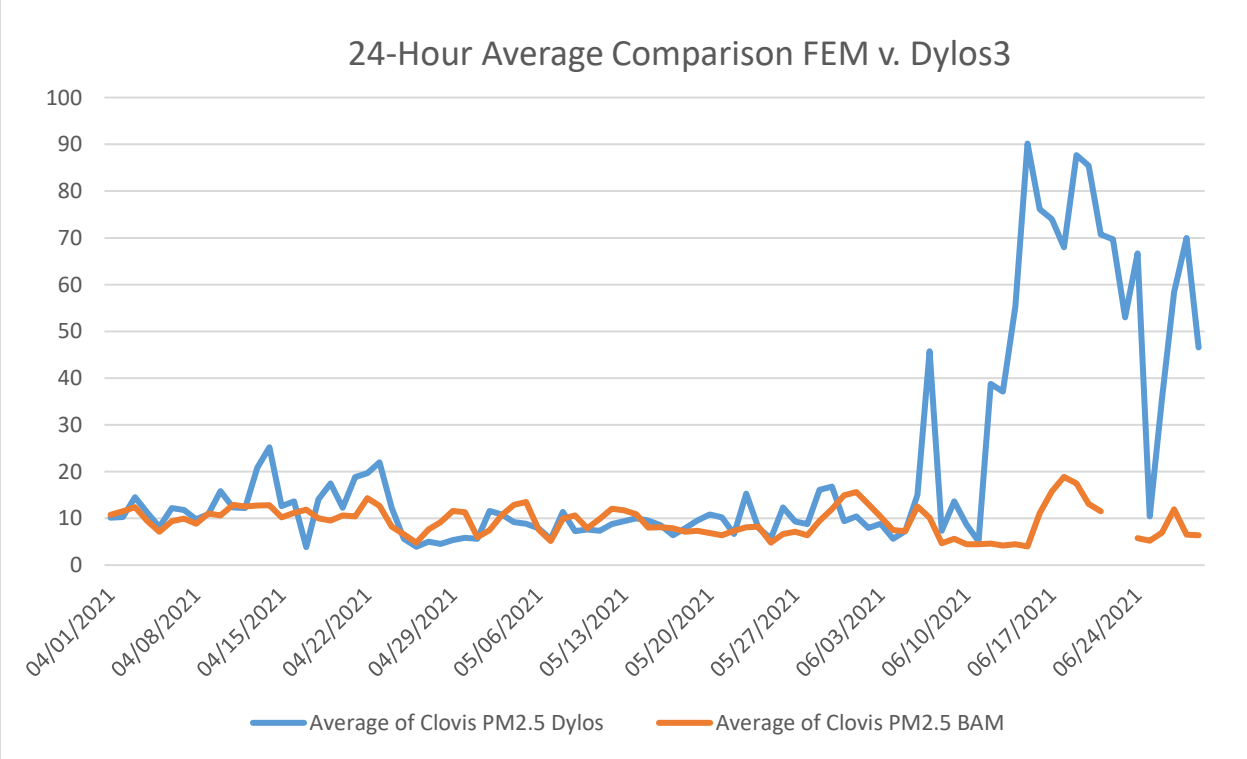


Dylos 3

For the 24-hour average, Dylos data had an 11.73 µg/m^3 high bias during the April 2021 through June 2021 period. For the hourly average, Dylos data had a 1.15 µg/m^3 high bias over the same period.







Statistical Summary

The following table provides a statistical summary of the PM2.5 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 1	52.56	327.95	179.37	0.01	1.04	42.96	0.01	1.33	40.20
Dylos 2	18.52	280.32	114.60	0.00	0.09	17.74	0.00	-0.19	20.34
Dylos 3	20.94	228.00	90.16	0.02	1.01	10.19	0.03	1.24	8.29
FEM	9.43	28.00	18.88						