



Technical Evaluation of Sensor Technology (TEST) Program

*AirBeam Sensor
2022 – 3rd Quarter
(Final Report)*



Introduction and Sensor Profile

This analysis report is focused on assessing the performance of the AirBeam sensor as part of the San Joaquin Valley Air Pollution Control District's (District's) Technical Evaluation of Sensor Technology (TEST) Program. The AirBeam sensor measures particulate matter (PM1, PM2.5, and PM10) using a light scattering method. As air is drawn through a sensing chamber, light from a laser scatters off of particles in the air stream. The AirBeam sensor also measures temperature and relative humidity.

Background and Approach of Evaluation Test

As part of the District's effort to evaluate the performance of a variety of low-cost sensors in the Valley, the District installed three AirBeam sensors at the Clovis-Villa air monitoring site in order to compare its performance with that of the regulatory PM2.5 monitor there. The AirBeam1 sensor first began reporting data on May 3, 2019. The datasets analyzed for this report include hourly and 24-hour average PM2.5 data collected from the AirBeam1 sensor and the regulatory Federal Equivalent Method (FEM) MetOne BAM-1020 continuous PM2.5 monitor at the Clovis-Villa 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

On July 20, 2022 a device failure caused the AirBeam 1 sensor to stop recording, there is no available data as of July 21, 2022. Thus, the analysis for this report covers the time period of July 1, 2022 through July 20, 2022. During this period, hourly data was removed from the calculation of bias when either the AirBeam 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 influence PM2.5 levels by either trapping pollutants near the surface or dispersing them. Generally, California's experiences weather patterns that alternate between high pressure systems and low pressure systems that move through the region every two to four days. High pressure systems dominated much of the 3rd quarter of 2022 wherein strong atmospheric stability and long stretches of triple digit temperatures presided over the Valley. Indeed, only two low pressure systems brought improved dispersion, lower temperatures, and a bit of precipitation during the quarter – one during the first week of July and the other during the third week of September. Under the hot and stagnant conditions, ozone concentrations rose on the clear-sky days. In contrast, an influx of monsoonal moisture and remnants of Hurricane Kay provided cloud cover over the area at the end of July through early August. The clouds blocked sunlight, decreased ozone formation and lowered temperatures across the Valley during that period. Wildfires also impacted air quality during

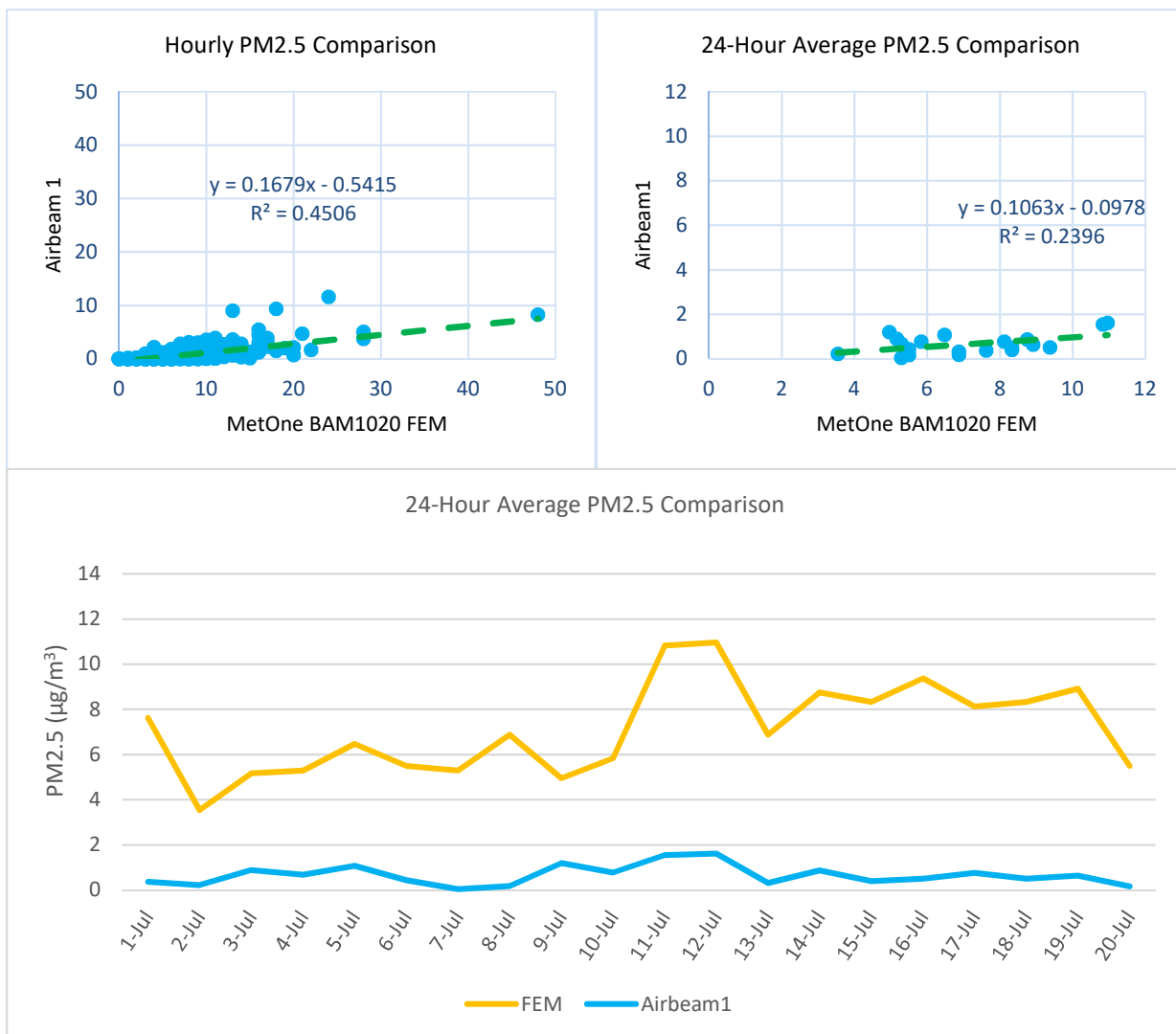
the 3rd quarter. Smoke from wildfires in the Sierra Nevada and in southern California infiltrated the Valley in mid-July and early September and PM2.5 concentrations increased as a result.

As of this period, all AirBeam sensors operated by the District have stopped operating and will not be replaced. This is the final quarterly analysis report for this sensor model.

Analysis of AirBeam Sensor Performance

AirBeam1

For the 24-hour average, AirBeam data had a low bias of -6.5 µg/m³ during the July 1, 2022 through July 20, 2022, period. For the hourly average, AirBeam data had a low bias of -6.4 µg/m³ over the same period.



Non-Reporting Sites

AirBeam0, Airbeam1, and AirBeam2

Data from both Airbeam0 and Airbeam2 was not available for this period. Airbeam1 experienced a hardware failure on July 20, 2022 and was removed the following day on July 21, 2022. These sensors sustained a hardware failures and are no longer operating. There is no planned replacement of these sensors.

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
Airbeam 0	---	---	---	---	---	---	---	---	---
Airbeam 1	0.70	11.60	1.60	0.45	0.17	-0.54	0.24	0.11	-0.10
Airbeam 2	---	---	---	---	---	---	---	---	---
FEM	7.10	48.00	11.00						