

# Air Pollutant Concentrations of Particulate Matter 2.5 within San Diego State University's Campus

Authors: Kathryn Paras, Abigail Crotz, Ahmed Hashi, Gloria Jimenez, Fred Rueger, Dr. Zohir Chowdhury

Affiliation: Public Health, San Diego State University

## ABSTRACT

Fine particulate matter with aerodynamic diameter of 2.5 micrometer (PM<sub>2.5</sub>) is an air pollutant that has been linked to produce adverse health effects. The purpose of this study is to measure the concentration of fine particles (PM<sub>2.5</sub>) within various pollution hot spots on the San Diego State University (SDSU) campus. Based on this study, the data showed an unusual high concentration of PM 2.4 within the East Commons food court that exceeds the US EPA PM 2.5 health standard of 35 micrograms in a 24-hr period.

## BACKGROUND

- Particulate Matter (PM) are small particles (acids, organic chemicals, metals, and soil or dust particles) and liquid droplets.
- Coarse Particles: PM that is larger than 2.5 but smaller than 10 micrometers.
- Fine Particles: PM that is 2.5 micrometers or smaller.
- Immediate health effects can cause coughing and irritation to the lungs and eyes.
- Long term effects can be decreased lung functions, irregular heartbeats, and premature death in people who have heart or lung disease.
- National standard for PM 2.5 in a 24-hour average is 35 micrograms.

## INSTRUMENTS & METHODS

Instruments:

- Dust-Trak: measures aerosol mass concentrations of PM<sub>1.0</sub>, PM<sub>2.5</sub>, and PM<sub>10</sub>. Aerosol contaminants that may be measured during a sample can contain dust, smoke, fumes, and mist. (Figure 1)
- P-Trak: measures the count of ultrafine particles (smaller than 1 micrometer). (Figure 2)

Figure 1:  
Dust-Trak

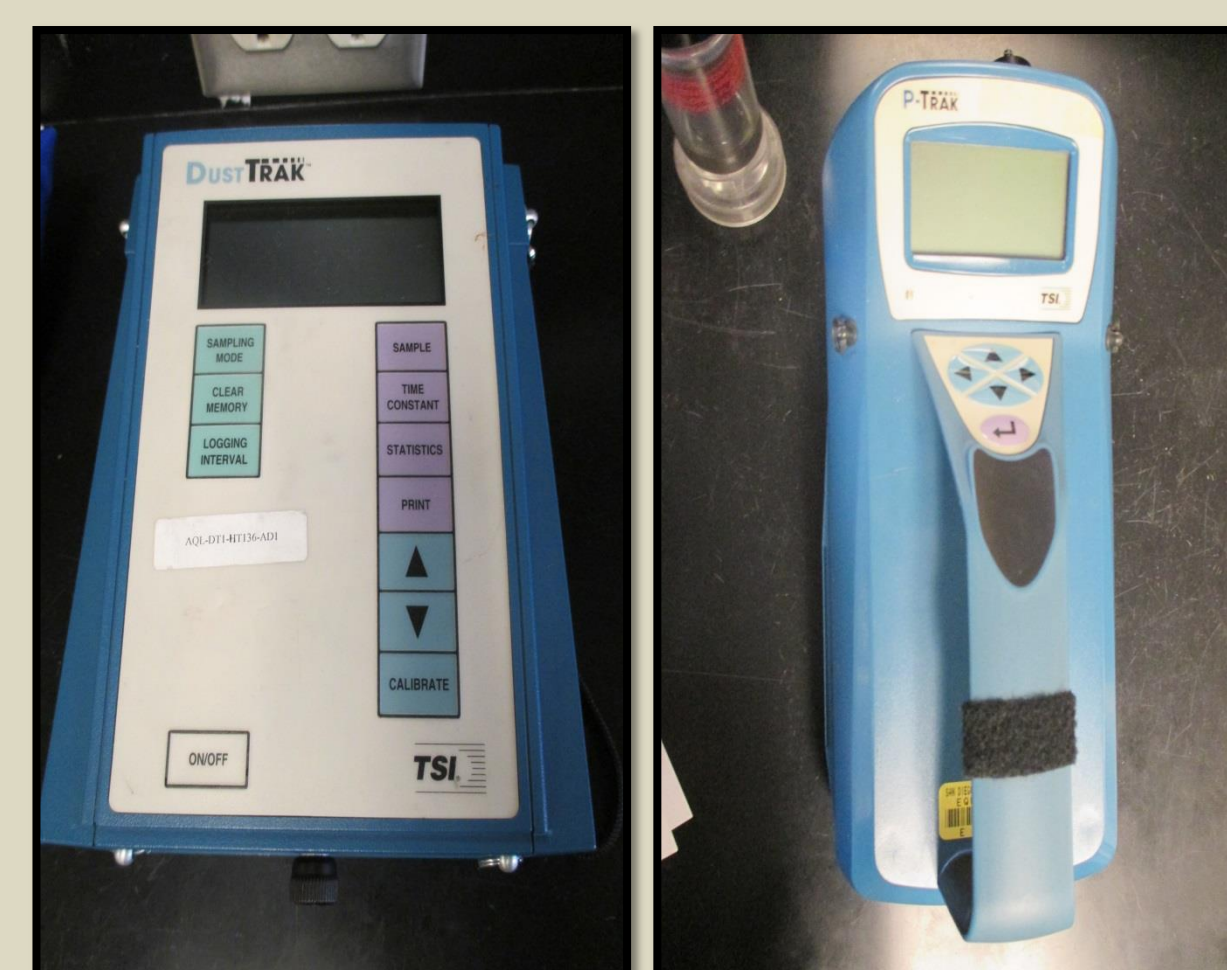
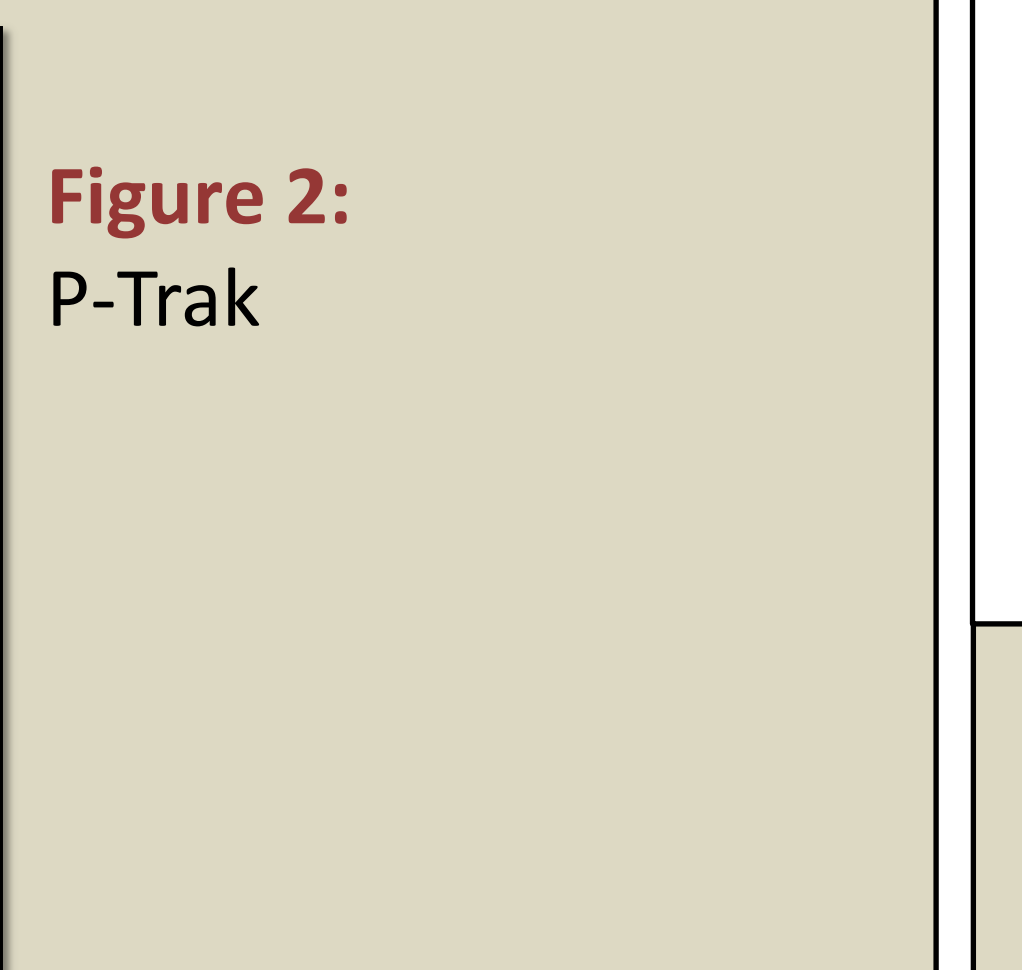


Figure 2:  
P-Trak



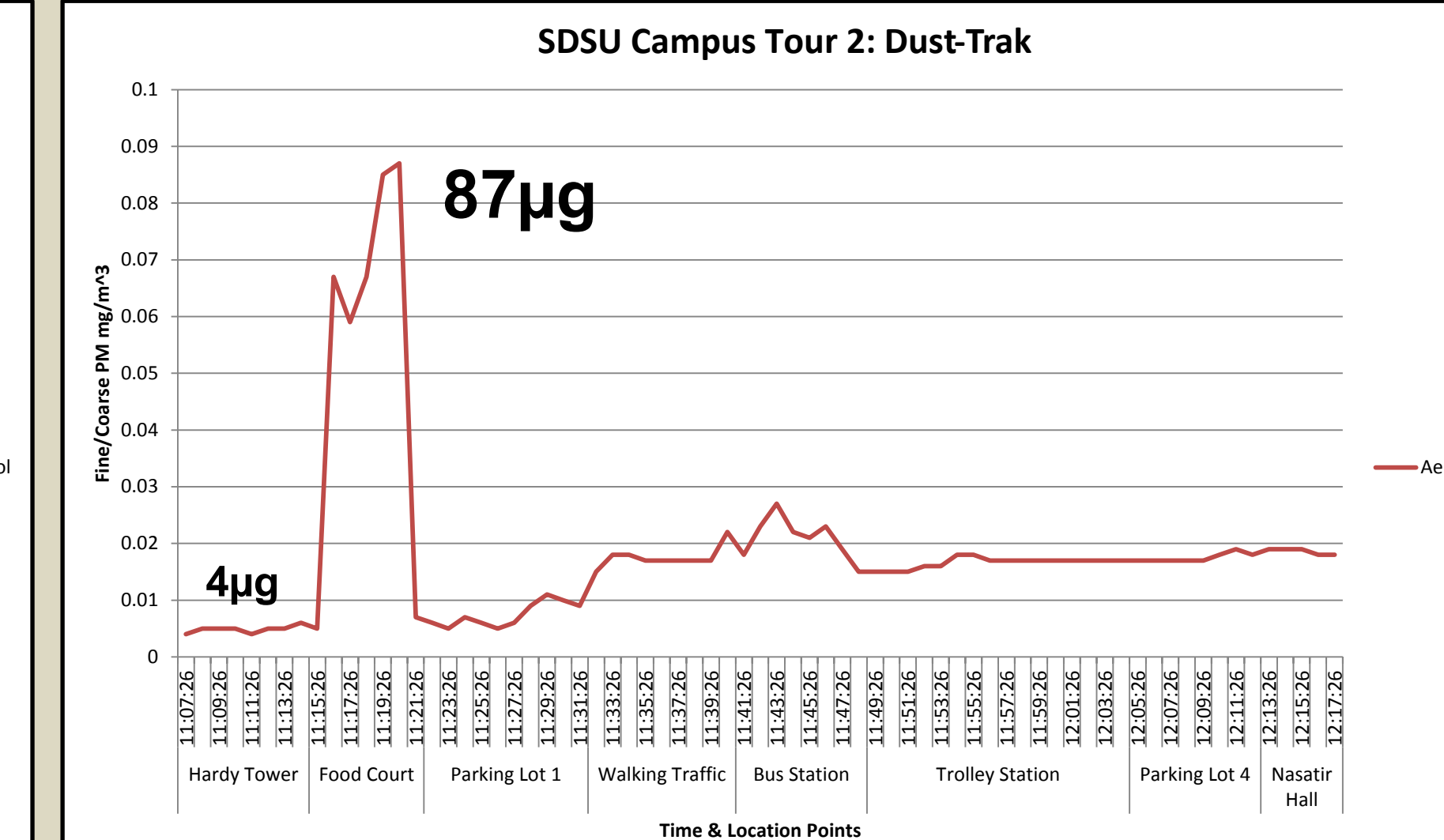
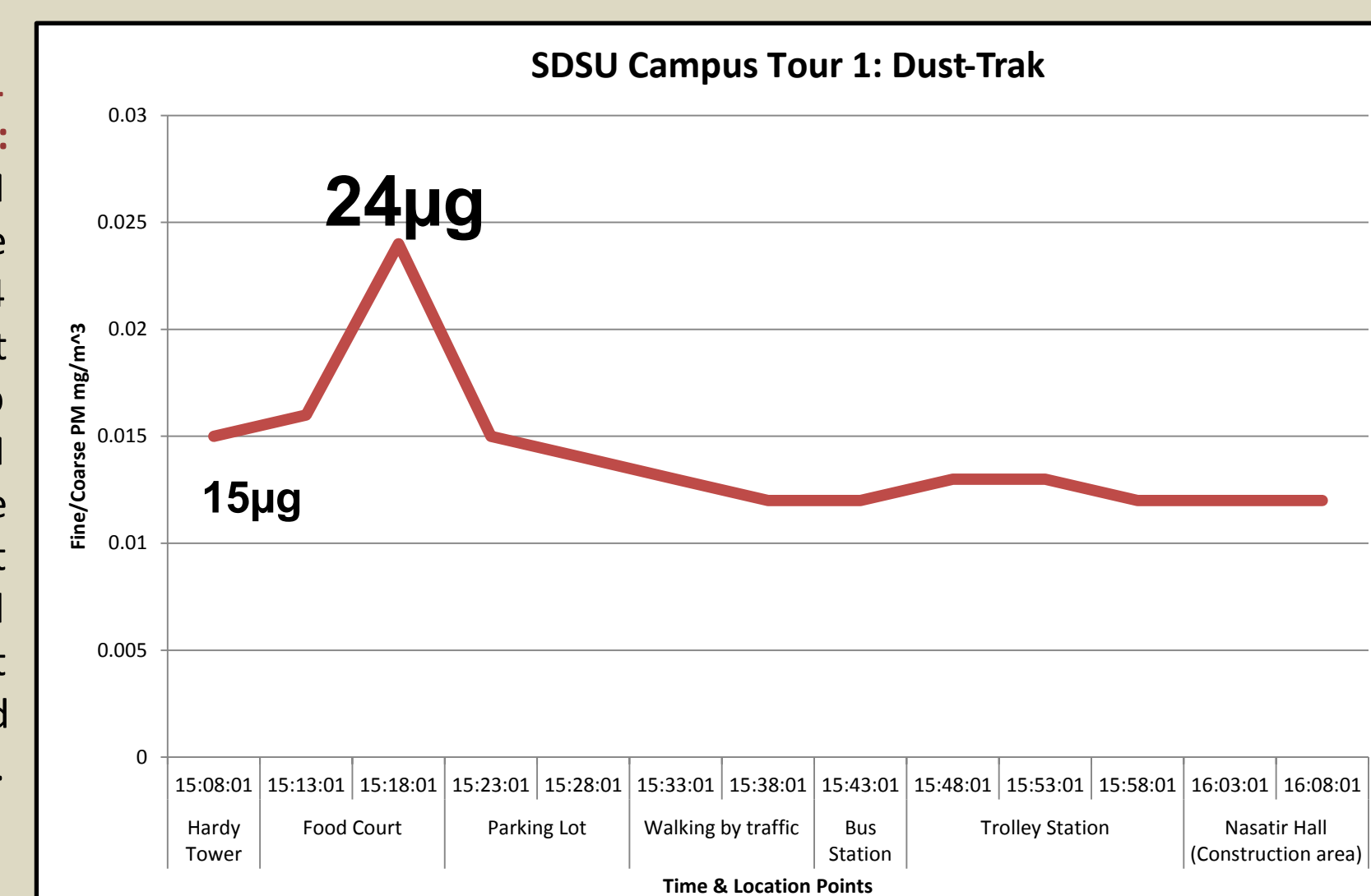
Methods:

Each data set that was collected utilized the instruments Dust-Trak and P-Trak or a combination of both. The first three data samples were taken around campus, the fourth taken strictly inside East Commons for a longer period of time, and the fifth sample was taken during high time periods collected from the previous data sample within various spots inside East Commons

Data Sample	Date	Instrument	Duration	Time	Log Interval
Campus Tour 1	09/13/13	Dust-Trak	1:05:00	15:08-16:08	5:00
Campus Tour 2	10/07/13	Dust-Trak	1:11:00	11:07-12:17	1:00
Campus Tour 3	11/20/13	Dust-Trak	1:01:00	16:39-17:39	0:10
Campus Tour 3	11/20/13	P-Trak	1:04:30	16:39-17:43	0:10
East Commons 1	02/11/14	Dust-Trak	6:04:10	9:17-15:31	0:10
East Commons 1	02/11/14	P-Trak	5:59:50	9:20-15:31	0:10
East Commons 2	02/18/14	Dust-Trak	3:08:40	9:54-13:02	0:10
East Commons 2	02/18/14	P-Trak	3:09:30	9:53-13:02	0:10

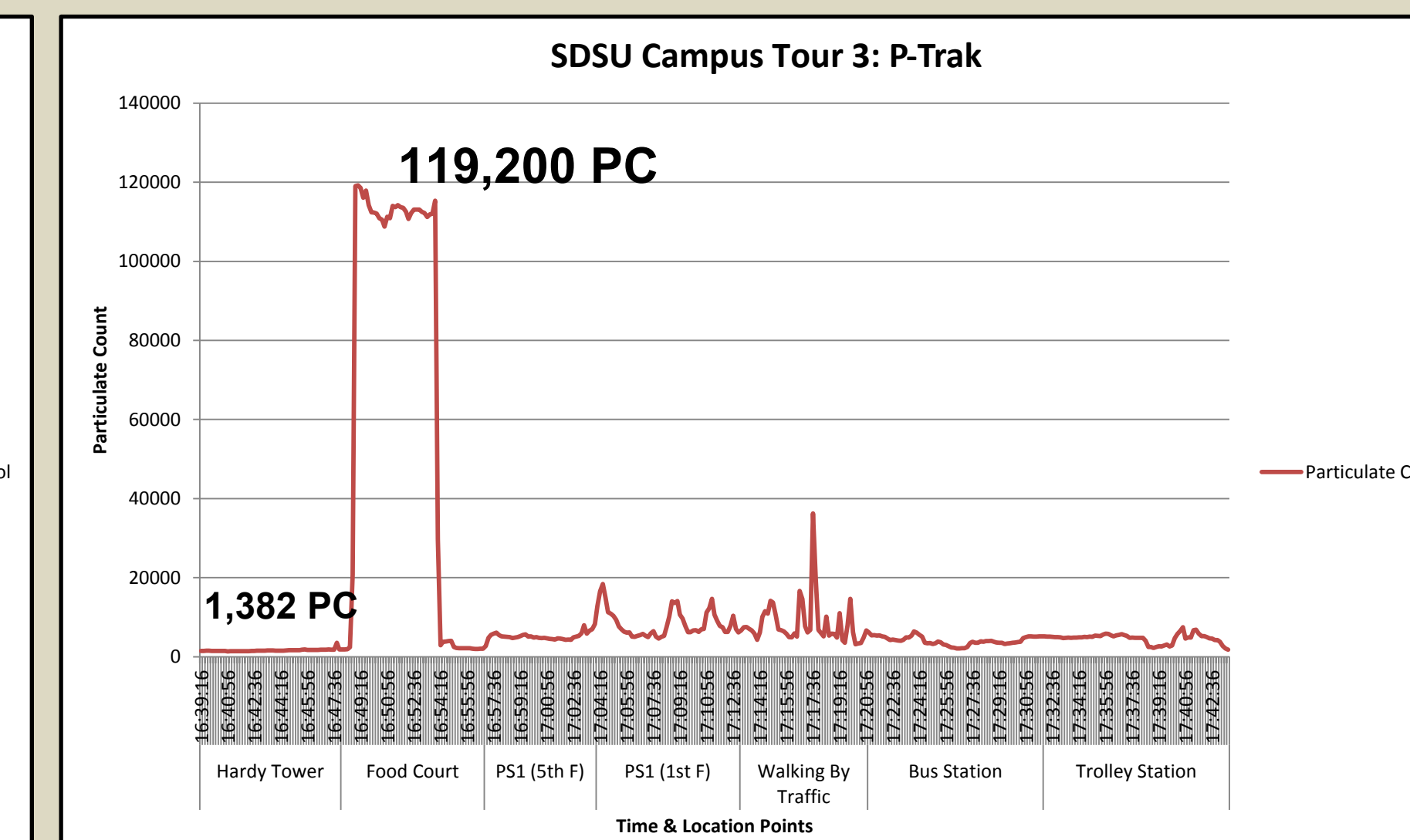
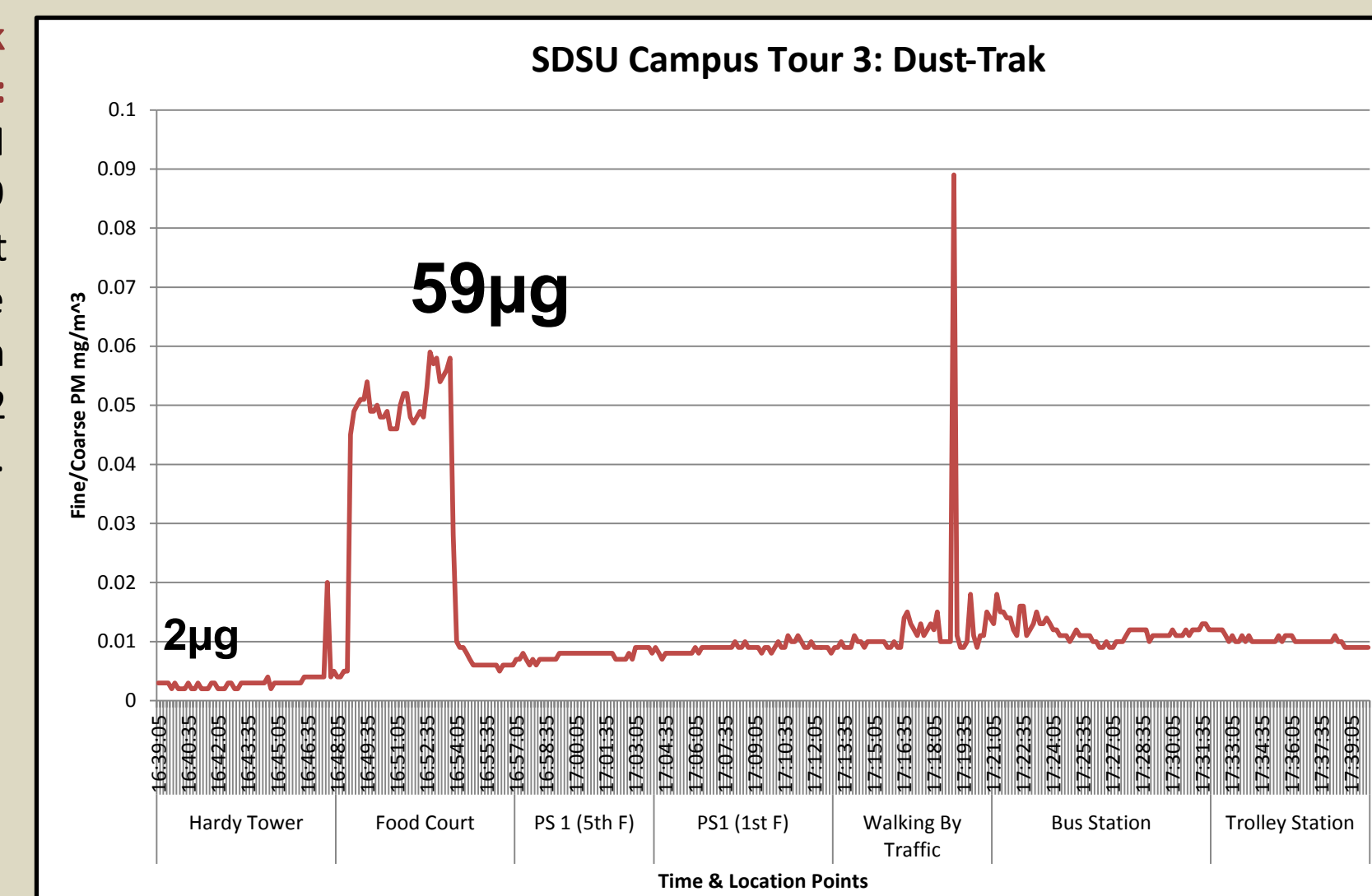
## RESULTS

**Campus Tour 1 (Top Left):** Maximum PM concentration at the food court of 24 micrograms at 3:28PM. The top three average PM concentrations are 20 micrograms at the food court and 15 micrograms at Hardy Tower and PS1.

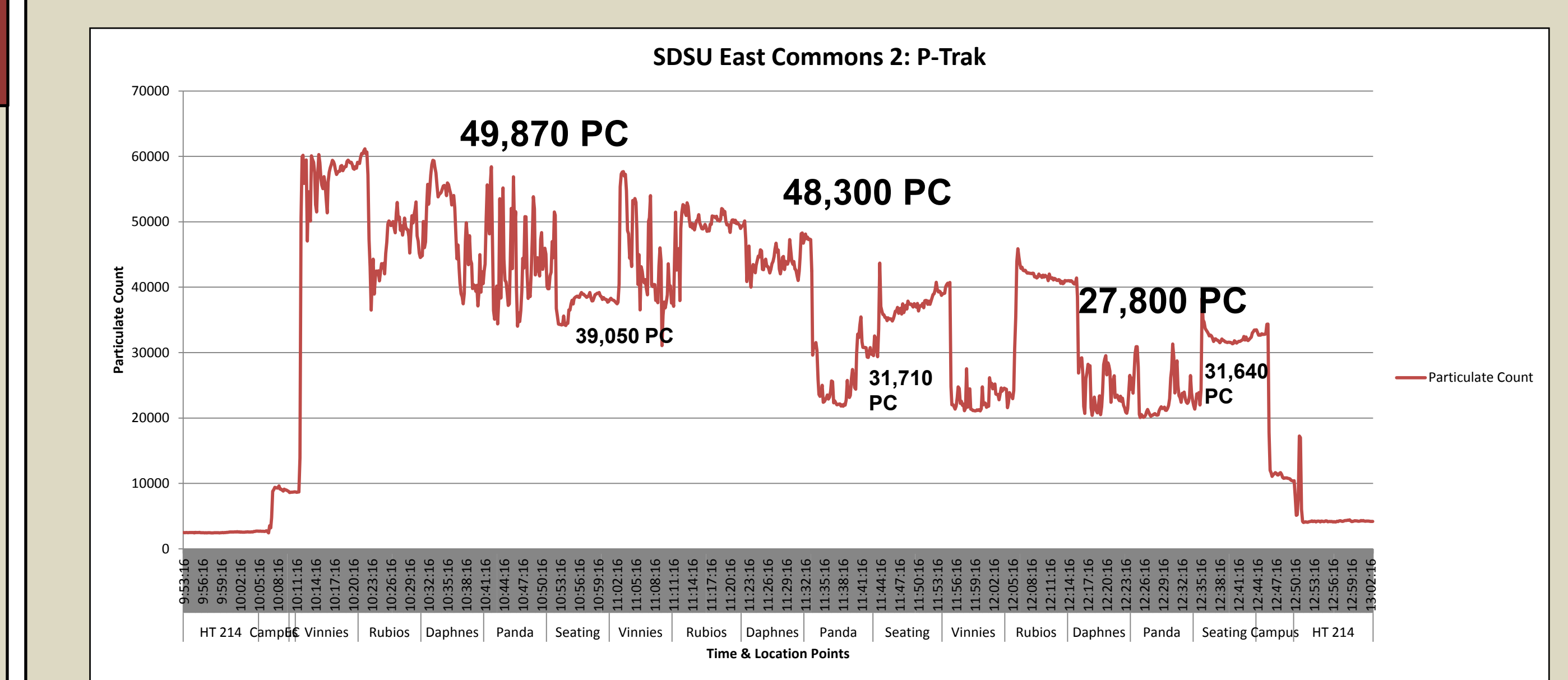


**Campus Tour 2 (Top Right):** Maximum of 87 micrograms of PM concentrations at 11:20AM inside the food court. The top three average PM concentration was inside the food court at 54 micrograms, bus station at 21 micrograms, and Nassitar construction at 19 micrograms.

**Campus Tour 3 (Bottom Left):** Maximum PM concentration of 59 micrograms at 4:52PM inside the food court with an average of 32 micrograms.



**Campus Tour 3 P-Trak (Bottom Right):** Maximum of 119,200 particulate count at 4:49PM inside the food court (average of 66,961) compared to 1,382 at Hardy Tower.

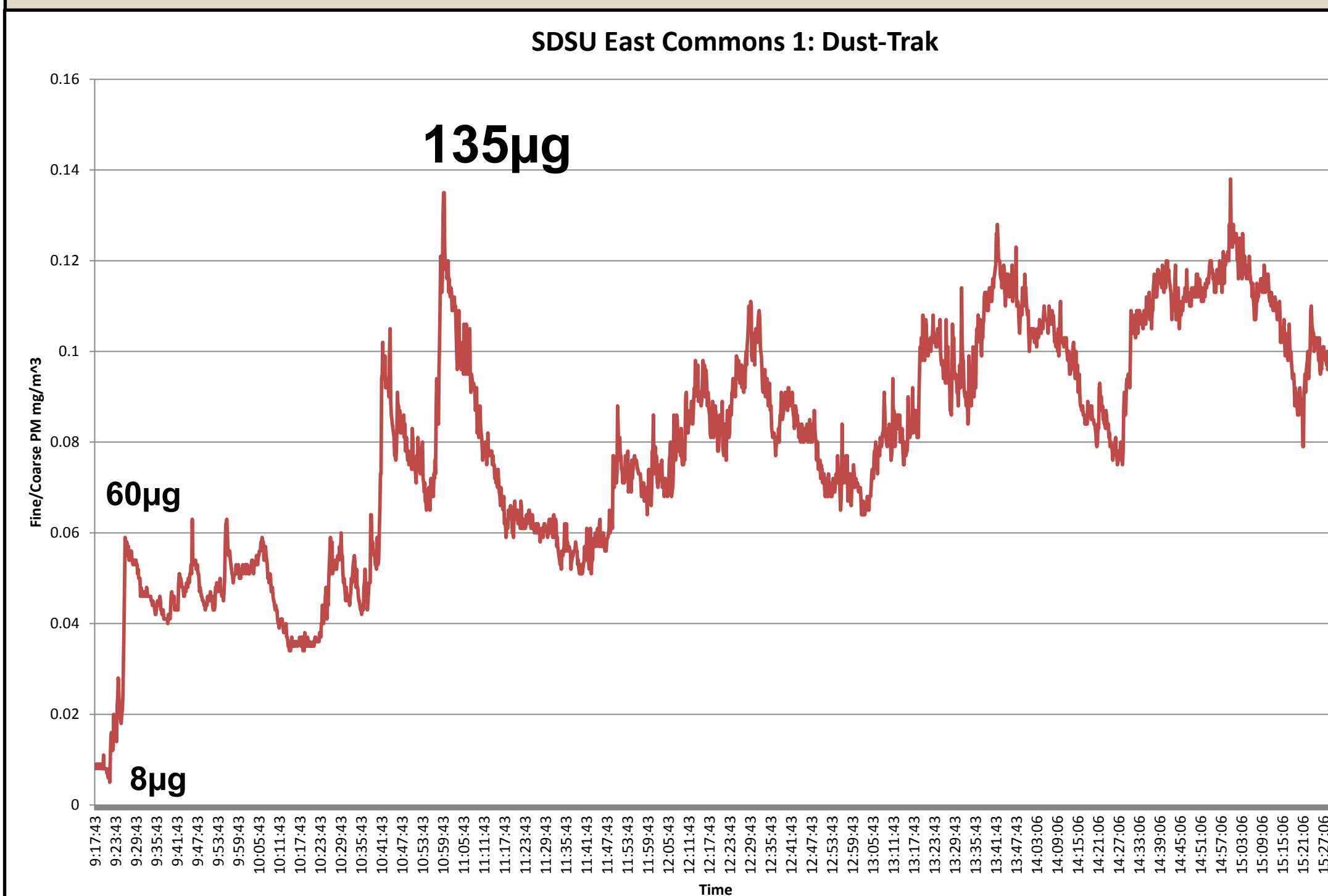


**East Commons P-Trak 2 (Above):** Particulate count data shows that the average high in cycle one was located at Vinnies with 53,189 particulate count, Rubios with 49,234 particulate count in cycle two, and Rubios with 38,797 particulate count in cycle three.

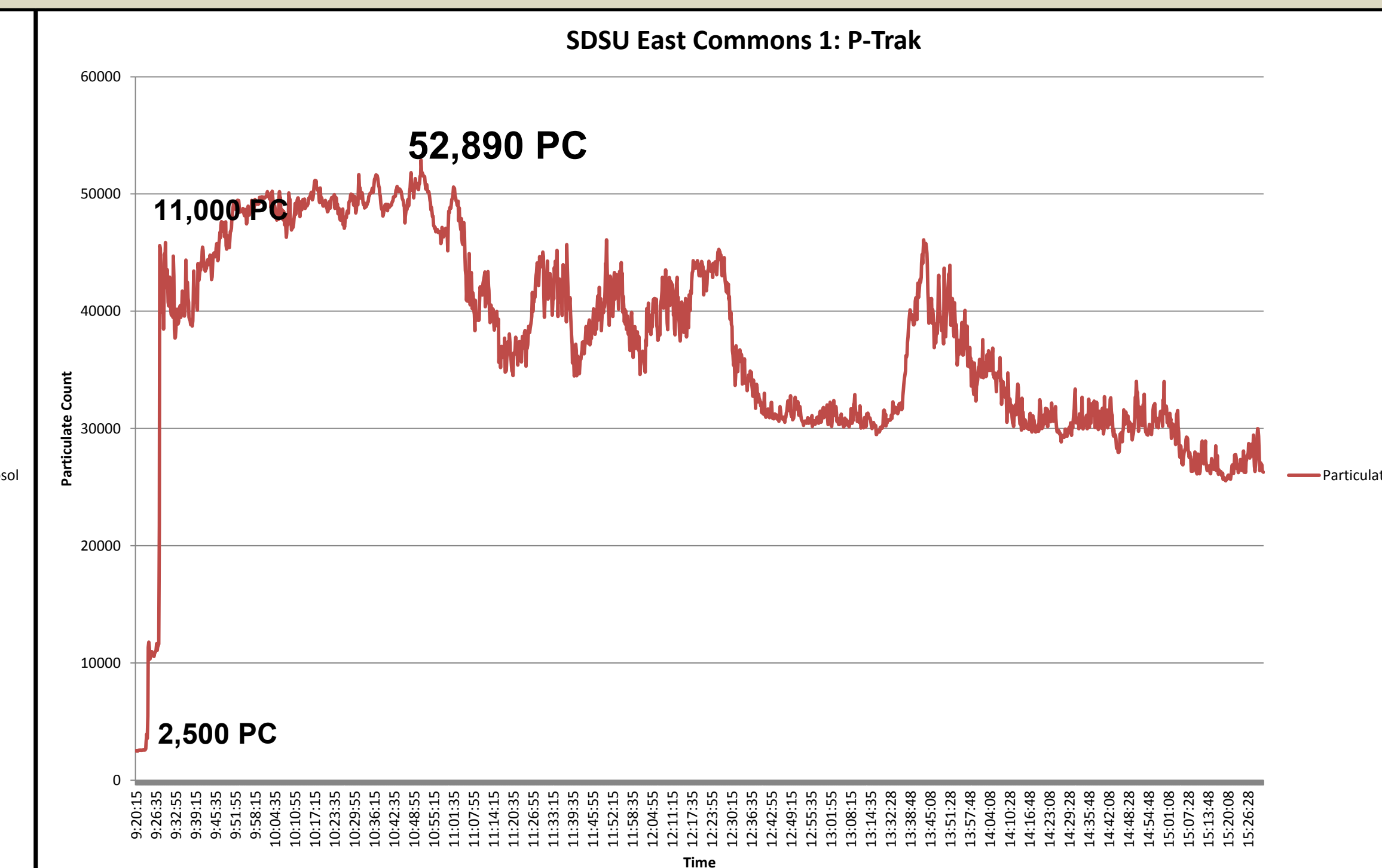
**US EPA Standard**



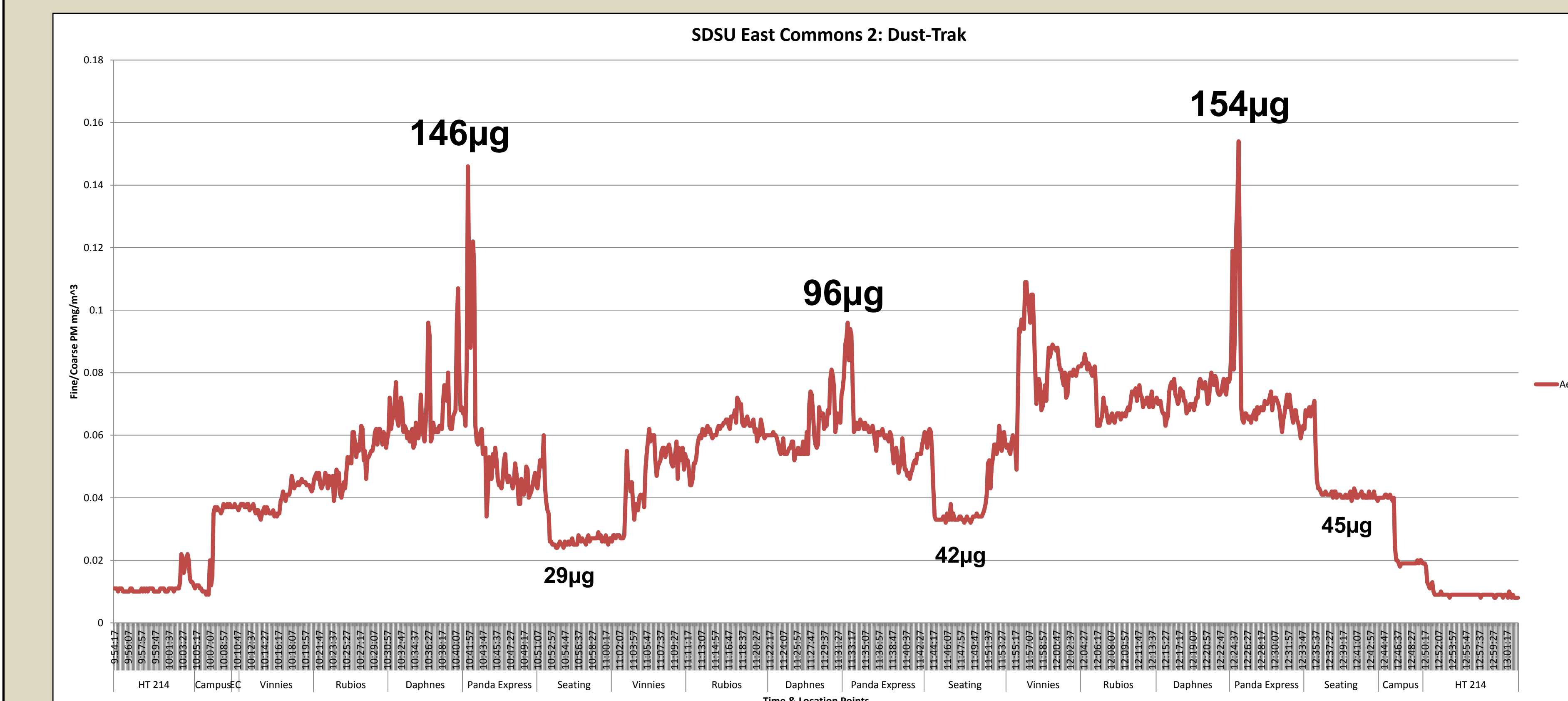
**Average Level at Peak SDSU Site**



**East Commons 1 Dust-Trak (Above):** PM concentration inside Hardy Tower Lab 214 is 8 micrograms and spiked all the way to 60 micrograms once entering the food court. The average PM concentration between 9:28AM to 3:30PM showed 71 micrograms and reaches a max of 135 micrograms at 10:59AM. Starting at 10:30AM – 11:00AM a large spike is apparent from then on there is a gradual rise every hour.



**East Commons 1 P-Trak (Above):** The PM count had about 2,500 particulate count inside the Hardy Tower lab 214 and a spike to 11,000 particulate count once entering East Commons food court. From 9:20AM – 1:18PM the maximum particulate count was 52,890 with an average of 40,464 and from 1:29PM – 3:31PM a maximum of 46,090 particulate count and an average of 31,857. The low particulate count between 12:30PM-1:30PM could possibly be accounted with the changing of the isopropyl alcohol in the P-Trak instrument.



**East Commons Dust-Trak 2 (Left):** Three different cycles all in which have Panda Express with the highest PM spikes, the first cycle at 146 micrograms, second cycle at 96 micrograms, and 154 micrograms in cycle three. Further analysis shows that the average in cycle one has Daphnes at the highest with 67 micrograms, Rubios, Daphnes, and Panda Express at 61 micrograms in cycle two, and Vinnies at 80 micrograms in cycle three. All three cycles show the seating area to have the lowest PM<sub>2.5</sub> concentration; with 29 micrograms in cycle one, 42 micrograms in cycle two, and 45 micrograms in cycle three.

## CONCLUSION

Based on the three campus tours a trend of high particulate matter was found within the East Commons food court, therefore further tests in East Commons 1 and East Commons 2 sampling shows at what hours are the peak times in which PM is emitting the most and also approximately which parts of the food court are emitting the most.

To further test this data East Commons 1 data measured the mass concentrations and particulate count during a six hour work day. Based on data collected from East Commons Data 1, the times in which the highest concentrations of mass and particulate count were revealed at 10:30AM-11:00AM spike and a gradual pick up of PM 2.5 concentration from 12:00PM on. Therefore, in East Commons Data 2 three cycles around the various parts (Vinnies, Rubios, Daphnes, Panda Express, and the seating area) inside East Commons was performed to find which of the areas were emitting the most PM 2.5 concentration and particulate count within the 10:00AM-1:00PM time period. Of the three cycles the high peaks occurred in transition from the end of Daphnes to the beginning of Panda Express sampling, with a peak of 146 micrograms in cycle one, 96 micrograms in cycle two, and 154 micrograms in cycle three. The lowest peaks were during samples taken from the seating area within East Commons. The average high peaks calculated in the three cycles are 132 micrograms at the transition between Daphnes and Panda Express, judging by this peak the PM 2.5 concentration greatly exceeds the US EPA standard of 35 micrograms.

All data collected within this study results in East Commons food court exceeding the 35 micrograms per 24-hour average standard set by the US EPA compared to other hot spots on the San Diego State University campus. The study shows that the average highest peaks occurring on campus are in between Daphnes and Panda Express from the times of 10:00AM-1:00PM.

## ACKNOWLEDGEMENTS

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