Special Purpose Monitoring Study – Claymont Mobile Monitoring Platform PM2.5 Project Plan Rev. 2

Project Title:

Claymont Mobile Platform PM2.5 Study

Category:

Limited term particulate monitoring

Background:

The citizens of Claymont Delaware have ongoing concerns regarding ambient PM concentrations in their neighborhood. Evraz Steel operates a specialty steel plant in Claymont, using scrap steel to produce custom steel plates. Evraz Steel has been the focal point of the Community's interest. The Community has been actively involved in a private citizen monitoring project since 2010 and has been successful in requiring the plant to install system upgrades to reduce particle emissions from their operation.

The State of Delaware is retro-fitting a Ford F-450 Mobile Van for use as a mobile monitoring platform. Community monitoring has indicated potential elevated PM2.5 concentrations in the Claymont area; therefore PM2.5 monitoring is the primary focus of the initial use of the Delaware mobile monitoring platform.

After additional internal DAQ discussion it was decided to incorporate more focused source/receptor monitoring activities relating to episodic dust releases from the Evraz facility. This involved changing one security camera to point in the direction of the Evraz slag handling area, and changing the FRM PM2.5 monitor to a PM10 monitor (involves reconfiguring the sample inlet; operational parameters remain the same).

Objectives:

- To compare PM2.5 concentrations in Claymont with PM2.5 concentrations at other areas in Delaware and with the federal 24-hour PM2.5 National Ambient Air Quality Standard (NAAQS).
- To compare Black Carbon measurements in Claymont with measurements at MLK in Wilmington.
- To identify potential local source impacts on ambient particulate air quality in Claymont.
- To evaluate the feasibility and operational potential of the mobile monitoring platform for special purpose ambient air monitoring projects.
- To evaluate episodic dust releases from the nearby steel plant in relation to ambient measurements of PM10 and PM2.5.

Project Implementation:

Site Selection The final site chosen was the parking lot behind the Lumber Liquidators retail store at 203 Naamans Road, Claymont, DE 19703. The critical criteria for the site location included: in the primary downwind direction of the Evraz steel plant, representative of the Aniline Village/Claymont area, comparability to federal PM2.5 monitor siting criteria, availability of electric power, accessibility, and permission of the property owner. Security of the site was initially a concern but no problems were reported.

A detailed site description, including photographs, will be included in the final study report.

Sample Collection/Analysis The mobile platform included the following equipment:

- Thermo Model 5030i SHARP Continuous PM2.5 monitor
- TAPI Model 603 Aethalometer (black carbon)
- Thermo Partisol 2025 PM10 FRM sampler
- Thermo 49i Ozone analyzer
- Thermo 49C/PS Ozone Calibrator
- Sabio Zero Air Generator
- Vaisala WXT 520 WS/WD Transducer

The continuous monitors (SHARP PM2.5, aethalometer, ozone, wind speed/wind direction) generated data as one-minute averages that was stored in the Envista database and can be used to generate 5, 15, and 60 minute averages.

The PM10 FRM sampler operated on a 1 in 3 day schedule in accordance with the established federal and state PM10 schedule for the duration of the project. Unfortunately, this was a newer version of the sampler used in the DAQ monitoring network and there were some software and firmware problems that resulted in multiple missed sample runs, particularly in the early part of the study. There is therefore less complete PM10 data than anticipated.

Study Duration Monitoring began in October 2013 and was completed in mid-March 2014. The Evraz plant ceased operations on December 13, 2013.

Original Objectives and Results

1. The mobile monitoring platform will be evaluated for usefulness and practicality for special purpose monitoring projects.

   Operation of the mobile platform generally followed the anticipated path; there were problems with individual monitors (particularly the Partisol PM10 sampler) but the platform itself performed well. There were no problems with power supply or communications.

2. Monitoring activities will be evaluated for practicality and quality of data generated.

Continuous monitors generally performed as expected; limitations appear to be related to physical space and monitoring inlet design. There were some issues with the new aethalometer but these were generally resolved as experience was gained with the monitor. Manual monitors had problems related to the specific monitor and method. The data collection system worked well and performed in real-time as a standard monitoring station. Overall data quality was documented adequately and will be evaluated in the final report.

3. Validated monitoring data will be compared to data from other Delaware monitoring sites and to applicable NAAQS.

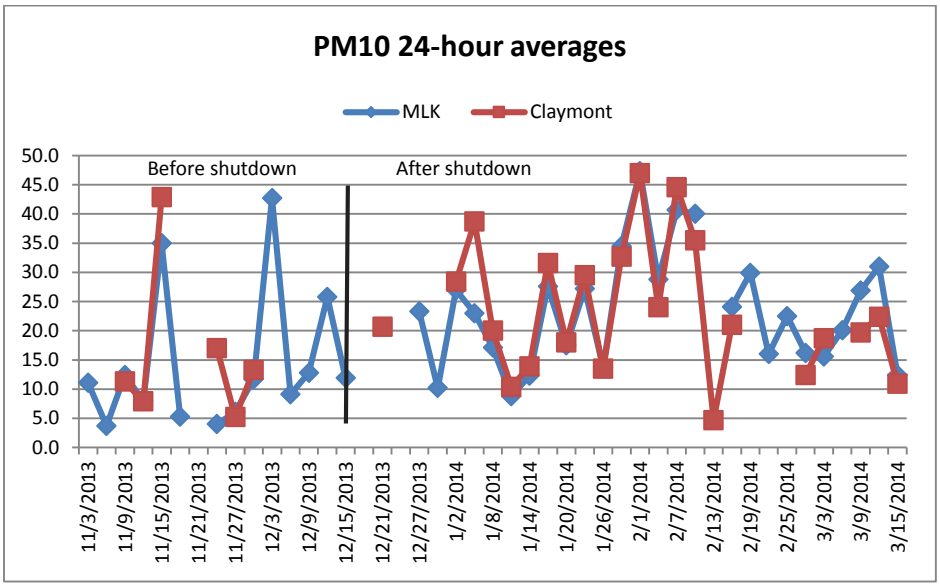
   Preliminary data for PM10, PM2.5, and black carbon were evaluated with respect to answering the following main questions: Could we detect a change in ambient concentrations related to the closing of the Evraz plant, and how do concentrations in Claymont compare to those in Wilmington?

   PM10

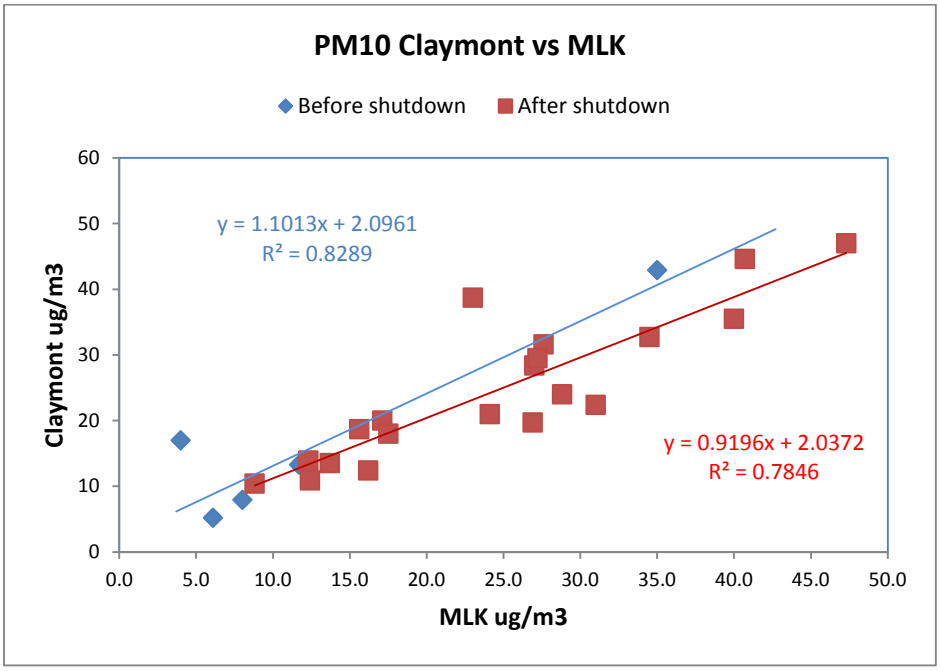
   Based on community monitoring results in previous years, it was expected that ambient PM10 concentrations in Claymont would potentially be impacted by the shutdown of the Evraz plant, while PM10 concentrations at MLK would not. Unfortunately, problems with the new PM10 monitor at Claymont resulted in only 6 out of 14 scheduled samples successfully collected prior to the Evraz shutdown. After the shutdown 22 out of 31 scheduled samples were successfully collected. This makes comparison of PM10 data before and after the shutdown problematic.

   The PM10 data was collected at both sites using the Partisol FRM samplers, which collects one sample per day and generates a 24-hour average concentration.

   Comparison of PM10 concentrations at Claymont vs Wilmington (MLK site) was more successful. Following is a time series chart of the PM10 concentrations at both sites during the study:



Below is a chart of the correlation between the MLK and Claymont sites before and after the Evraz shutdown. The low number of samples before the shutdown makes comparison problematic.



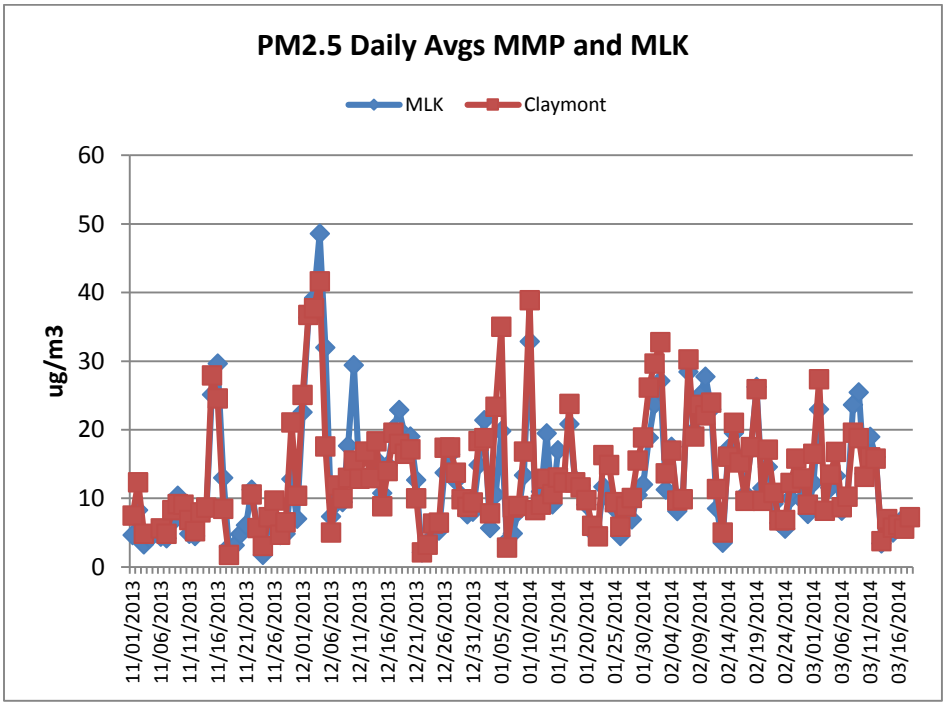
Comparing the time series and the correlations for the PM10 concentrations at Claymont and MLK both before and after the Evraz shutdown does not show any significant difference at Claymont relating to the shutdown.

PM10 concentrations at both sites are correlated, although the low number of samples collected before the shutdown makes that time period less significant.

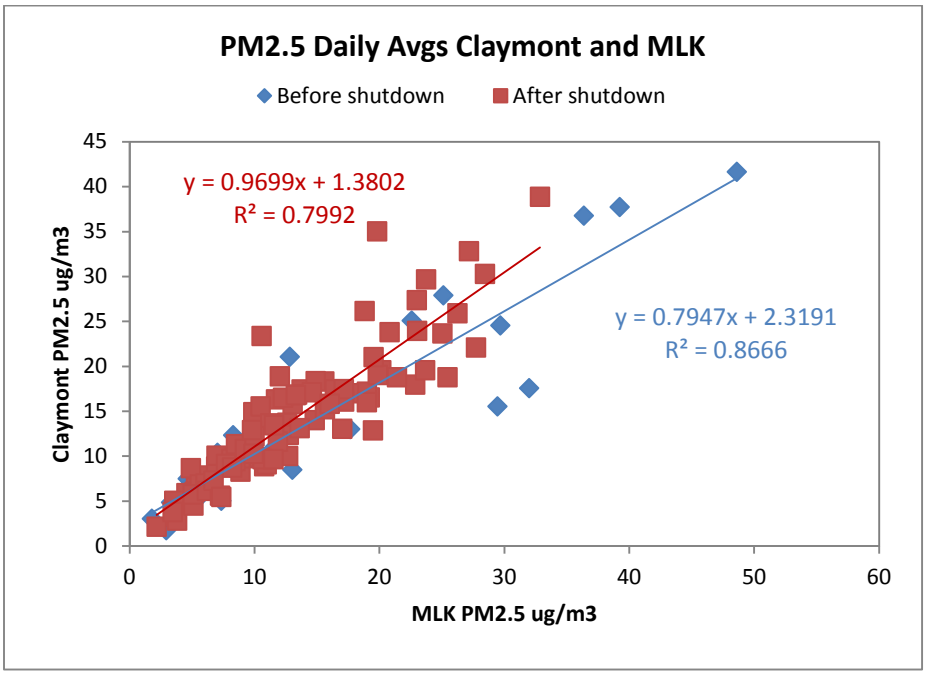
Comparison to the NAAQS: No exceedances of the PM10 24-hour NAAQS of 150 ug/m3 were recorded at Claymont or MLK either before or after the Evraz shutdown.

PM2.5

Hourly PM2.5 data was collected at Claymont and at MLK in Wilmington. Daily 24-hour averages were calculated by averaging the individual hourly data over the daily 24-hour period collected at each site.



Comparison of the correlations between the PM2.5 concentrations at Claymont and MLK is shown in the following chart.



The correlation between PM2.5 at Claymont and MLK did not show any significant difference before and after the Evraz shutdown. PM2.5 concentrations at both sites were well correlated.

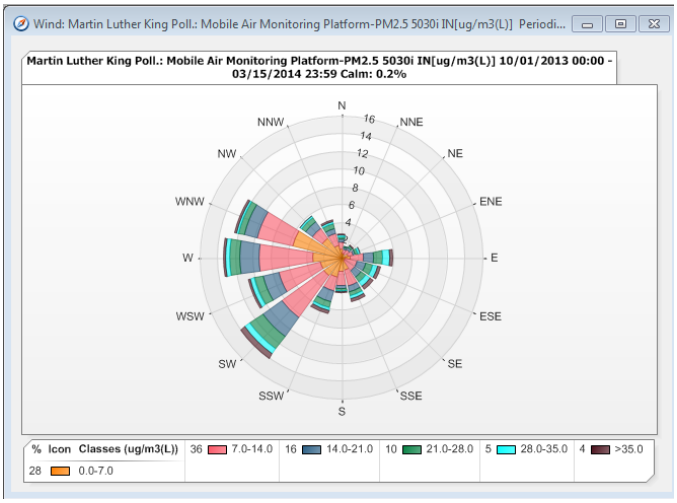
Comparison to the NAAQS: In early December there was a regional episode of elevated PM2.5 concentrations, and several exceedances of the PM2.5 24-hour NAAQS of 35 ug/m3 were recorded at both Claymont and MLK. There were also a few high readings in early January that were also associated with regional episodes. There were no days of elevated PM2.5 at Claymont that were not also elevated at other regional sites.

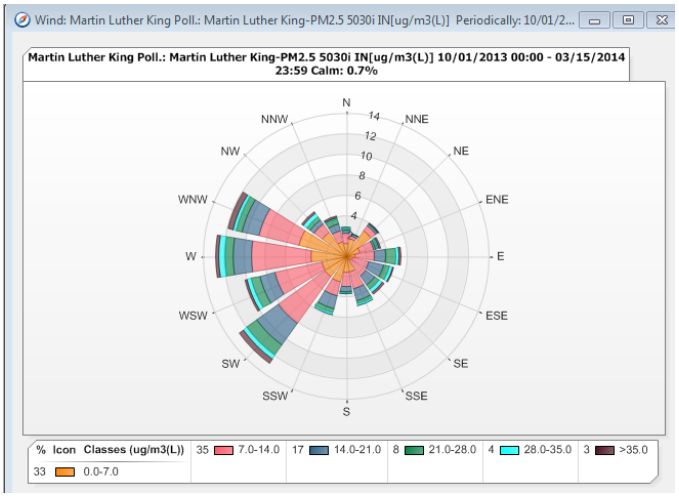
Ozone (O3)

Hourly ozone (O3) data was collected and compared to data from the nearest permanent monitoring site at Bellevue State Park as well as with the urban MLK site. The hourly data were well correlated (correlation coefficient = 0.899 for Bellevue and 0.893 for MLK) and nothing unusual was seen with the Claymont data. The permanent monitoring network is therefore considered to be representative of ozone concentrations in the Claymont area. No exceedances of the NAAQS occurred at any site during the study time period.

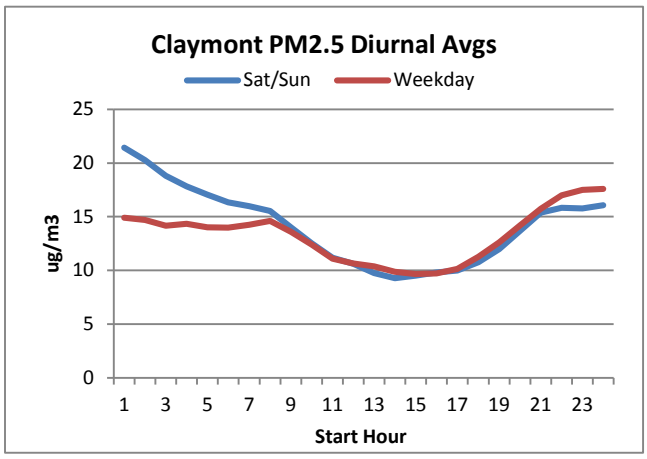
If possible, local and regional source impacts and pollutant diurnal patterns will be evaluated.

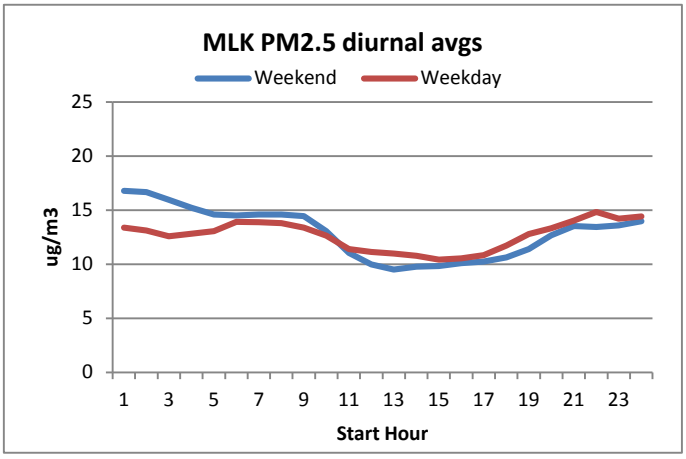
Hourly average PM2.5 concentrations vs wind direction did not show any significant pattern consistent with specific local source impact. Elevated concentrations occurred with wind direction from all sectors.





Diurnal patterns of PM2.5 at both MLK and Claymont were similar.





Conclusions

The preliminary conclusion is that monitoring did not detect significant differences in ambient concentrations of PM2.5 or PM10 related to the Evraz shutdown. Concentrations were well correlated with levels monitored in Wilmington at the MLK permanent monitoring site.