

www.placer.ca.gov/apcd

Thomas J. Christofk, Air Pollution Control Officer

MEMORANDUM

TO: Board of Directors, Placer County Air Pollution Control District

FROM: Yushuo Chang, Planning and Monitoring Manager

AGENDA DATE: April 12, 2007

SUBJECT: The Data Analysis Report on the Roseville Railyard Air Monitoring

Project (Information)

Action Requested:

None, this is an information item to present the second of three annual reports describing the analyses of the RRAMP data. This second annual report covers the data collected in 2006.

Background:

On December 9, 2004 the Board approved Resolution #04-21 authorizing the Chairperson and the APCO to sign an Agreement with Union Pacific Rail Road (UPRR) in regard to diesel particulate matter (DPM) resources toward the District's effort in conducting a PM air-monitoring project. The Roseville Railyard Air Monitoring Project (RRAMP) has a three-year cycle (2005-2007) associated with the mitigation plan. The second-year monitoring took place between June and October 2006, and focused on air monitoring at locations upwind and downwind of the railyard. At the conclusion of monitoring, the collected data set was forwarded to the Desert Research Institute (DRI) to conduct a comprehensive data analysis. This staff report will be the summary of DRI data analysis results for the second-year monitoring data.

Discussion:

Objective of RRAMP Data Analysis

DRI performed the necessary data review, analysis, and interpretation to support the first of two general objectives of the study: (1) to determine the impacts from the UPRR facility as measured as the differences between upwind and downwind monitoring site pairs; and (2) to determine any discernible trends in reduced impacts over a three-year period as a result of emissions mitigations implemented by UPRR. The second objective will be determined following the third year of monitoring. The DRI report (Report) is the

2 of 7

second of three annual reports to be provided by DRI. This 70 page report is available from Staff and will be posted on our website for your detailed review.

Evaluation and Validation of RRAMP Data

According to the findings in the first-year data analysis, the TAC reviewed the wind data collected during the 2005 sampling period and then decided to modify the sampling period for filter-based samplers on a 7-hour basis (between 10:00pm to 5:00am) diurnal time period where the winds are from upwind to downwind monitoring sites. Using such an enhanced upwind/downwind monitoring strategy, the TAC expects to detect the differences between upwind and downwind measurements that could represent the maximum impact from the Railyard alone.

Consistent with last year, each RRAMP monitoring site consisted of the following instruments: continuous monitors for PM2.5, black carbon [BC] (indicative of diesel particulates), and nitrogen oxides [NOx]; filter-based samplers for PM2.5 mass, organic and elemental carbon; and meteorological and ancillary equipment. Continuous monitors and meteorological equipment provide hourly average concentration measurements and can be analyzed with respect to specific wind conditions. Filter-based samplers, on the other hand, collect PM samples over a range of wind conditions for 7-hours period, which is the period that winds blow from upwind toward downwind sites. The meteorological monitors measure wind speed and wind direction

The second-year monitoring of the project began on June 15 and was scheduled to end September 30, 2006. Two weeks were added to the project due to the air quality impact of the Ralston Fire. The actual end date was October 15, 2006. The same pairs of upwind/downwind sites (Denio-Pool and Church St.-Vernon St.) were used. Both pairs of upwind/downwind sites functioned during the entire second-year monitoring period. The two weeks extension was due to the significant particle impacts resulting from Ralston fire incident in Roseville area. The data collected during the two weeks period of the fire incident will be excluded in the future data analysis to ensure the concentration measurements would reflect the impacts from the rail yard alone. A summary of the continuous data collected during the 2006 study period is shown in Table 1.

Table 1 Summary of RRAMP Continuous Measurements During Summer 2006.

	Denio Site					
	Wind Spd	Wind Dir	NO	NOx	ВС	PM2.5
Monitoring period	6/15 - 10/15	6/15 - 10/15	6/15 - 10/15	6/15 - 10/15	6/15 - 10/15	6/15 - 10/15
total observations	2965	2965	2952	2952	35584	2965
Count	2963	2963	2853	2853	32820	2942
% data capture	99.9%	99.9%	96.6%	96.6%	92.2%	99.2%

RRAMP Data Analysis Report PCAPCD Board of Directors Meeting

Agenda Date: April 12, 2007

3 of 7

	Pool Site					
	Wind Spd	Wind Dir	NO	NOx	ВС	PM2.5
monitoring period	6/15 - 10/15	6/15 - 10/15	6/15 - 10/15	6/15 - 10/15	6/15 - 10/15	6/15 – 10/15
total observations	2965	2965	2952	2952	35584	2965
count	2963	2963	2906	2906	34424	2638
% data capture	99.9%	99.9%	98.4%	98.4%	96.7%	89%

	Church St. Site					
	Wind Spd	Wind Dir	NO	NOx	ВС	PM2.5
monitoring						
period	6/15 - 10/15	6/15 - 10/15	6/15 - 10/15	6/15 - 10/15	6/15 - 10/15	6/15 - 10/15
total						
observations	2965	2965	2952	2952	35584	2965
count	2965	2965	2888	2888	34106	2944
% data capture	100%	100%	97.8%	97.8%	95.8%	99.3%

	Vernon St. Site					
	Wind Spd	Wind Dir	NO	NOx	ВС	PM2.5
monitoring period	6/15 - 10/15	6/15 - 10/15	6/15 - 10/15	6/15 - 10/15	6/15 - 10/15	6/15 – 10/15
total observations	2965	2965	2952	2952	35584	2965
count	2965	2965	2926	2926	33738	2941
% data capture	100%	100%	99.1%	99.1%	94.8%	99.2%

As can be seen from the table, we successfully captured a very high percentage of possible data. This reflects a successful field operations program.

Results

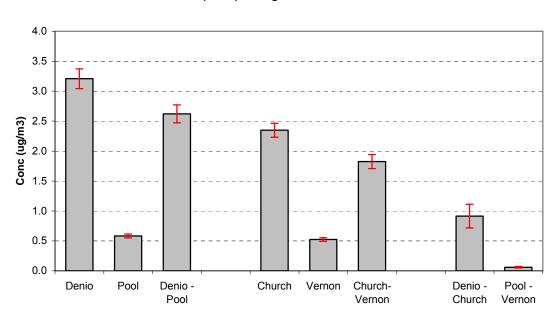
The Report describes a number of detailed statistical analyses; some of the key results are summarized here. Three screening criteria were established to determine the conditions upon which upwind-downwind analyses are appropriate: (1) winds need to be from a semi-circular arc between 45 degrees (i.e., northeasterly) through 225 degrees (i.e., southwesterly); (2) only winds from 0.5 to 4 m/s were used to avoid calm or windy conditions; and (3) only overnight hours from 10 PM to 5 AM PST were used. This is the time frame when the winds blow most consistently across the rail facility directly from the upwind to the downwind locations, and therefore the emissions from the rail facility can most readily be detected.

Once the subset of appropriate data was determined, the Report evaluated the differences between upwind and downwind site concentrations of BC, PM2.5, NO, and NOx. The results are shown in Figures 1 through 4. The data collected during the Ralston Fire period were excluded from the data analysis.

4 of 7

Figure 1 shows the 7-hour average concentrations of black carbon. This bar chart shows the average concentrations over the 2^{nd} year study period for which data are available from both pairs of upwind and downwind sites. The concentrations at both downwind sites (Denio and Church) are significantly higher than at their corresponding upwind sites (Pool and Vernon). The red bars depict the uncertainty of the values depicted, and as can be seen, these are small in comparison to the observed concentrations. From a statistical standpoint, we have greater than a 99.9% confidence that these findings are real and not due to chance alone. Also shown in Figure 1 are the differences between the upwind and downwind pairs to show the presumed impact from the rail yard facilities. In the 2006 intensive sampling period, the difference between Denio/Pool pair is over 2 μ g/m³. In addition, the comparisons of the both upwind sites and both downwind sites are shown as the two rightmost bars. These are relatively small, indicating that the upwind sites and downwind sites consistently reflect the same conditions.

Figure 1 Black Carbon 7-hour average concentration



7-hour (22-05) average BC Concentrations

Figure 2 shows the same depiction for PM2.5. While the downwind sites have levels which are statistically higher than the upwind sites, these differences are not as pronounced as for BC. This is because PM2.5 is a regional pollutant that could be from road dusts which affects both upwind and downwind sites. Nevertheless, the differences between upwind and downwind sites are in the order of 6 to 8 μ g/m³.

5 of 7

Figure 2 PM_{2.5} 7-hour average concentration

7-hour (22-05) average PM2.5 Concentrations

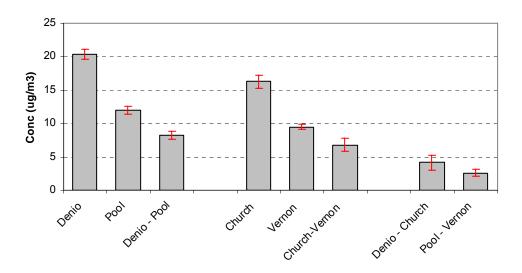
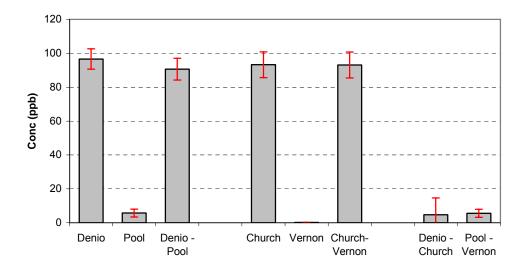


Figure 3 is a similar chart for NO concentrations. NO is a good indicator of fresh NOx emissions, since ultimately with time, NO converts to other nitrogen products. This chart may be the most indicative of all that the downwind sites are picking up the emissions from the rail yard facility. While downwind sites show concentrations about 100 parts per billion (ppb), the upwind sites are less than 10 ppb.

Figure 3 NO 7-hour average concentration

7-hour (22-05) average NO Concentrations



6 of 7

Figure 4 shows the results for NOx, which is NO plus other oxides of nitrogen, often nitrogen dioxide (NO2). While the results of Figures 3 and 4 are very similar, there are some interesting differences. The downwind sites show a very high percentage of NOx as NO, meaning these sites are dominated by fresh emissions. Conversely, the upwind sites have a low percentage of NOx as NO, meaning the upwind areas are affected to a much greater degree from aged NOx emissions, perhaps attributable to earlier mobile source emissions in the local or greater Sacramento area. In any case, the differences between upwind and downwind influences are dramatic.

160 140 120

7-hour (22-05) average NOx Concentrations

Figure 4 NOx 7-hour average concentrations

100 Conc (ppb) 80 60 40 20 0 Denio Pool Denio -Church Vernon Church-Denio -Pool -Pool Church Vernon

The interesting aspect of the overall scope of the data analyses is that all the results are consistent with each other, and show that the monitors are capturing effects of the rail yard emissions.

Conclusion

The Report showed generally good agreement with no significant biases between paired instruments. The improved operating procedures adopted in the second year greatly improve data quality. The value of the analyses is strongest when time-averaging the data over periods of seven hours. The differences in mean concentrations between the two pairs of downwind and upwind sites (Denio-Pool and Church-Vernon) are all significant at above the 99% confidence level.

Downwind sites show statistically significant impacts of BC, NO, NOx, and PM2.5. The ratio of NO/NOx indicates that downwind sites are dominated by fresh NO emissions RRAMP Data Analysis Report PCAPCD Board of Directors Meeting

Agenda Date: April 12, 2007

7 of 7

while upwind sites are more indicative of aged NO emissions. It strongly suggests that the downwind sites are indeed picking up the emissions from the rail yard facility.

Overall, results were very similar to those presented after the first year of monitoring. There was a substantial increase in NO, NOx, and BC at the downwind sites relative to the upwind sites, with the largest differential for NO. The multiple-year trend analysis will be conducted after the end of the third year of sampling.

Fiscal Impact:

None, this data analysis report (Report) is the second of three annual reports that provide descriptive and statistical analyses of the RRAMP data. The District's FY 2005/2006 Budget contains funding to support the contract signed between the DRI and the District. As of this time, there will be no fiscal impact on the District to continue finishing the following 3rd annual report of RRAMP data analysis and multiple-year trend analysis.

Recommendation:

None, this is an informational item to provide an overall status to your Board on the RRAMP second-year data analysis. The Report will be posted on the District's website in the section containing rail road related information.