Klamath Falls $PM_{2.5}$ Attainment Plan Appendix 4

Klamath Falls $PM_{2.5}$ Levels Compared to Background Concentrations

Submitted to: EPA

December 2013

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Last Updated: 12/31/13

Report

Klamath Falls PM2.5 Levels Compared to the Background Concentrations

Submitted to: EPA

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July 2012

Last Updated: xx/xx/xx
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DEQ 03-??-###

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State of Oregon
Department of
Environmental
Quality

Executive Summary

Introduction

Klamath Falls, Oregon has PM2.5 levels that violate the National Ambient Air Quality Standard (NAAQS) during the winter months. The PM2.5 is either generated locally or is transported into Klamath Falls from outside areas. A background site south of Klamath Falls was established to determine which of these scenarios is occurring or if a combination of these is occurring.

The background site was selected based on early plume modeling which showed winds from the south during the highest PM2.5 levels. The site was located at the California/Oregon border at the Lower Klamath Refuge Maintenance Facility on stateline road. Figure 1 shows the location of the Klamath Falls Petersen School monitor and the background monitor.

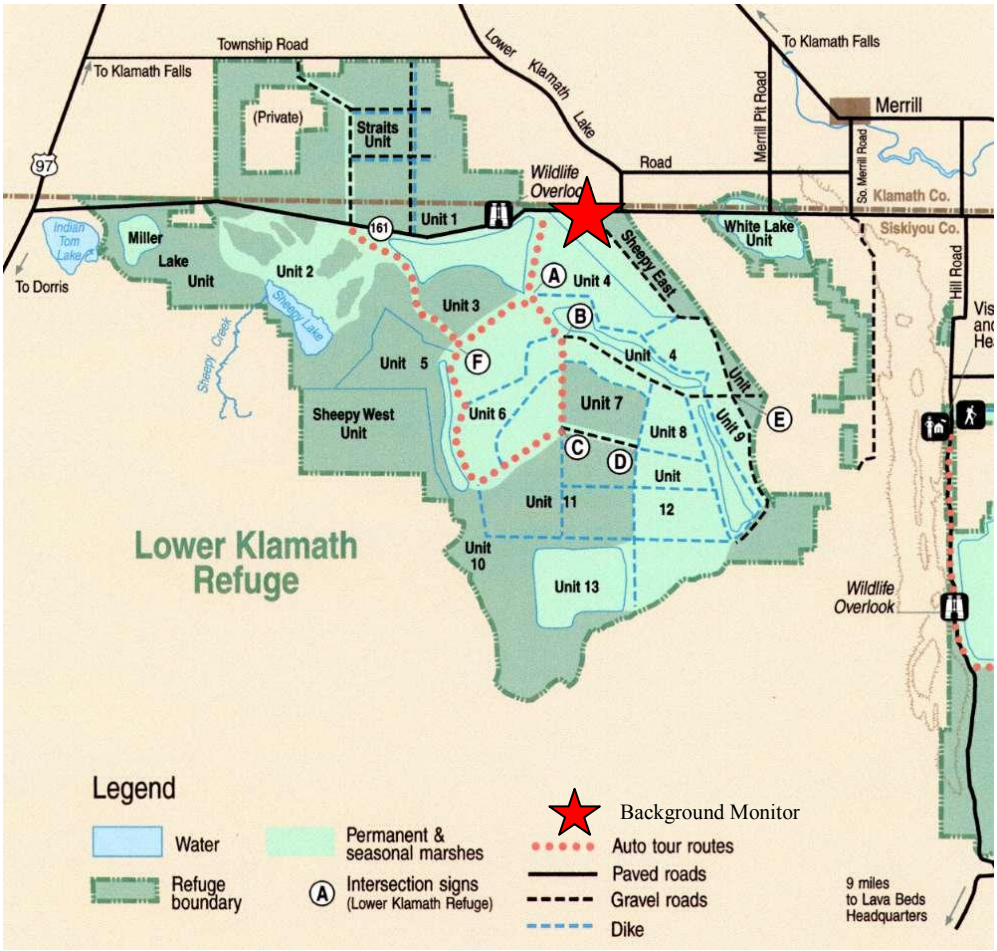

Figure 1: Background Monitor: Lower Klamath Refuge Maintenance Area Location.

This report will show if $PM_{2.5}$ is seen at outside of Klamath Falls in the surrounding area.

Method

Klamath Falls Petersen School site is a well established site which contains PM2.5 Federal Reference Monitoring, hourly visibility monitoring (Nephelometry), and meteorology. The back ground site contained hourly visibility monitoring (Nephelometry), and meteorology. Hourly nephelometry data was collected and converted to PM2.5 estimates using the linear squared correlation equation derived from comparing the 24 hour average FRM PM2.5 data with the 24 hour average nephelometry (BScat) values. The correlation equation converted hourly BScat averages into hourly PM2.5 estimates in ug/m3.

Results

The Department of Environmental Quality (DEQ) conducted a special study to determine the impact of PM2.5 outside the nonattainment area. The purpose was to determine if any emissions from the south of Klamath Falls were transported into the community. DEQ determined that the air along the California-Oregon border was a very low concentration. In no case did the ambient PM2.5 rise above the national standard of 15 micrograms per cubic meter except in the middle of the summer. Winter concentrations were all less than 12 micrograms per cubic meter. Only in August did concentrations rise as high as 18 micrograms per cubic meter likely due to wildfire smoke. The chart (figure 1) below shows the data.

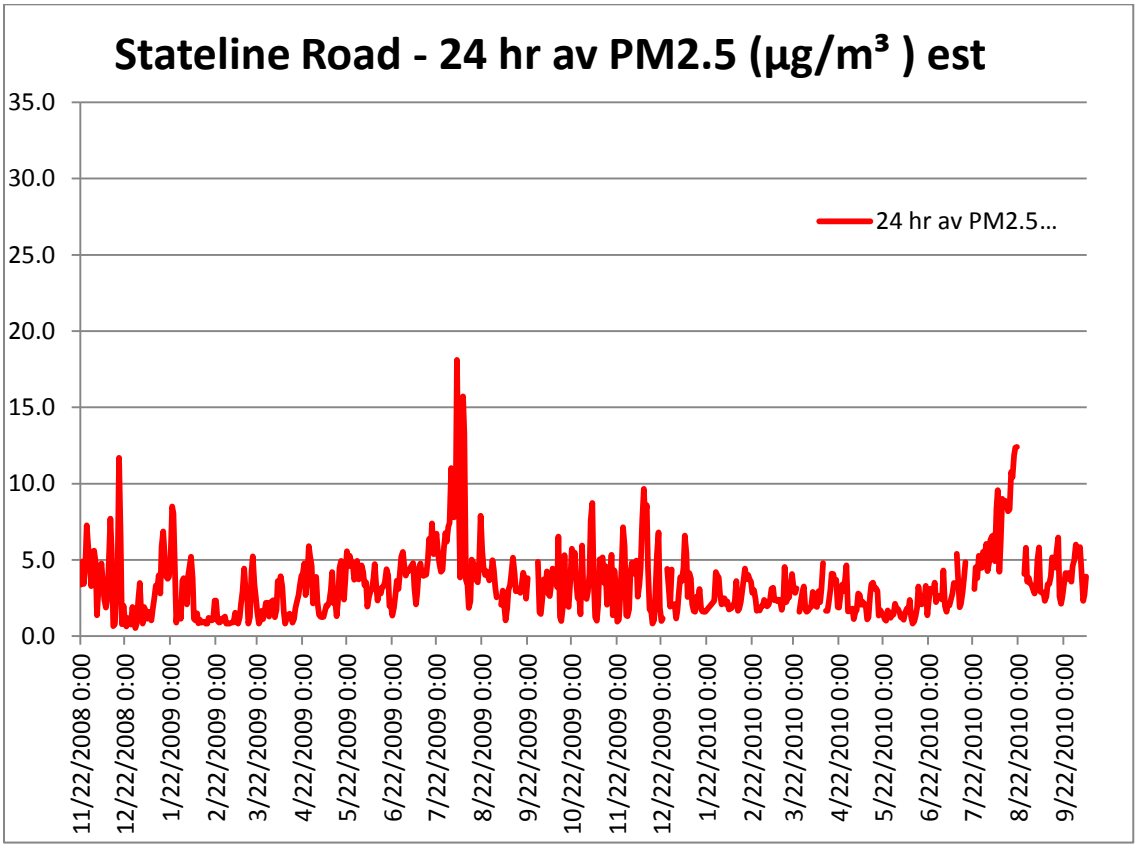

Figure 2. Average Daily $PM_{2.5}$ Estimates

Hourly values where compared on days that where the FRM sampler was above the NAAQS and the nephelometers at Petersen School and the background sites were operating for at least 18 hours. The day before and after these exceedances were also included to include the elevated values which are known to occur over the evening/morning hours. The diurnal hourly average was calculated for each site and compared in Figure 3.

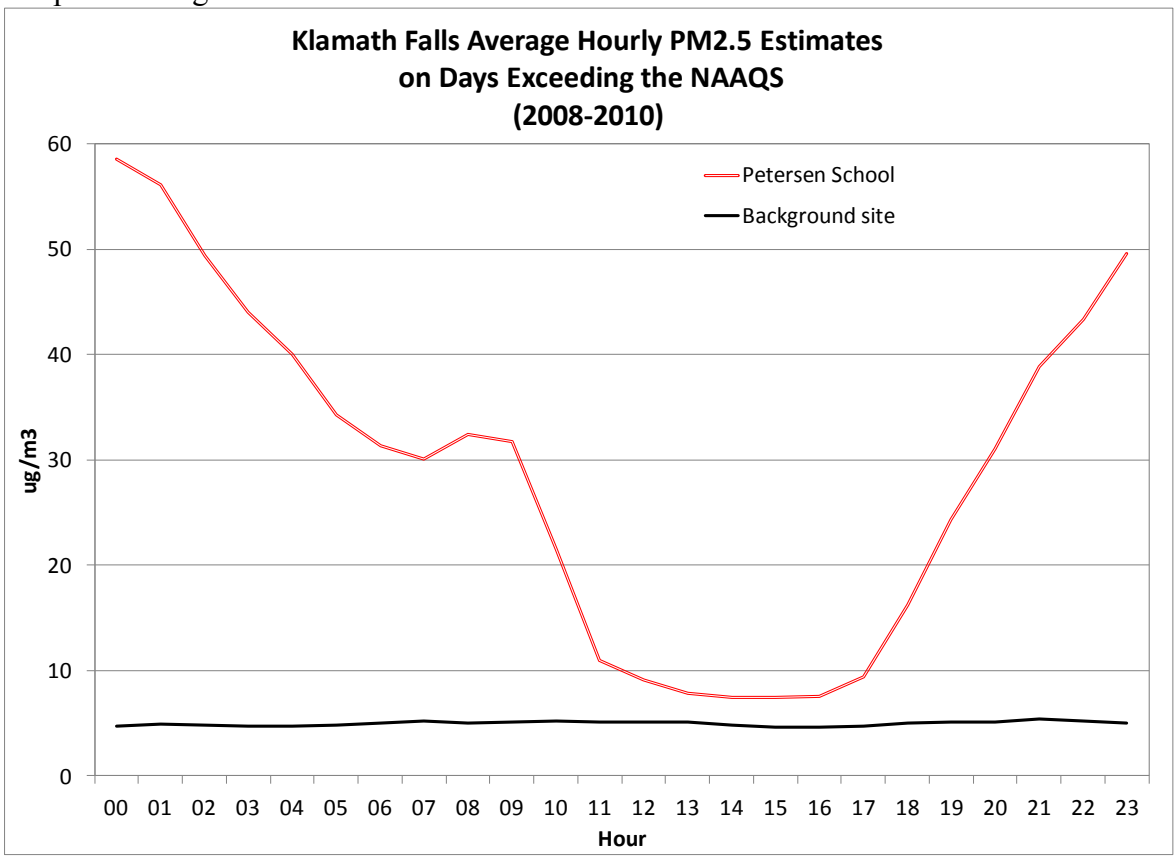

Figure 3. Average Hourly $PM_{2.5}$ Estimates on days when the PM2.5 > NAAQS

The Department views data in terms of the NAAQS. The 98th percentile average for the three years including 2008-10 was 8.6 micrograms per cubic meter, although the three years took data from different times of the year and only 2009 was a complete set of data. The following table (Table 1)shows the distribution.

	Average concentration Micrograms/Cu. Mtr.	Maximum concentration Micrograms/Cu. Mtr	98th percentile concentration Micrograms/Cu. Mtr.
2008 Nov - Dec	3.4	11.7 (12/18/08)	7.7 (12/12/08)
2009 Jan – Dec	3.5	18.1 (08/05/09)	8.6 (12/12/09)
2010 Jan - Oct	3.3	12.4 (08/21/10)	9.6 (08/08/10)

Table 1: The average, maximum and 98th percentile concentration

The wind roses on these days was generated (Figure 4) and shows very low wind speeds mostly emanating from the northwest and the southeast. For the most part the wind speeds where below four mph which would allow an inversion to persist.

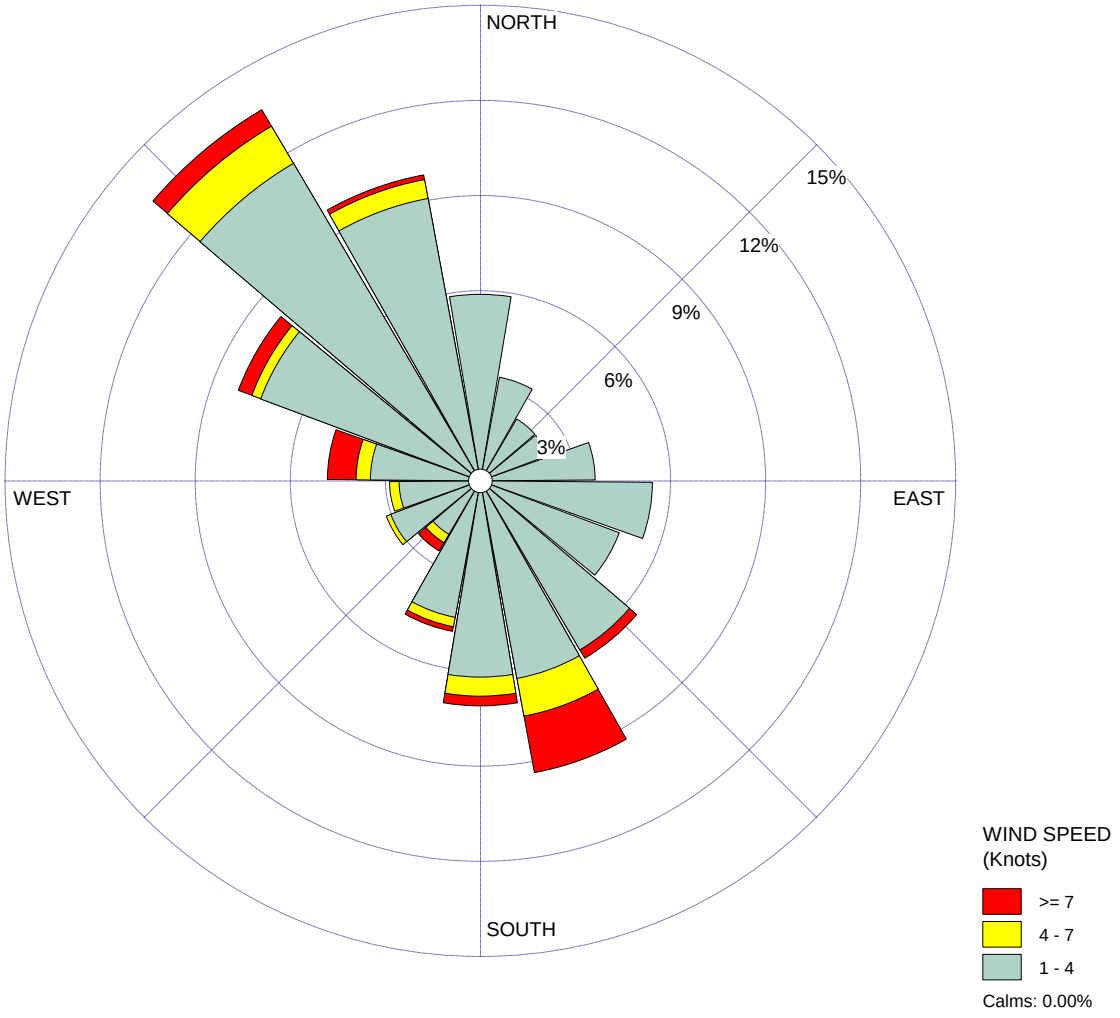

Figure 4. Petersen School Windrose on Days when the $PM_{2.5}$ > NAAQS

Discussion

The background site was consistently low during the most elevated $PM_{2.5}$ days at the Klamath Falls Petersen School site. The background site showed no variation by time of day and was very near the clean air level of 2ug/m3 that the nephelometer at when fed very clean air. The Petersen School site showed the familiar diurnal pattern associated with overnight inversions and evening emissions. The Klamath Falls site also shows a morning bump which could possibly be associated with increased emission activity when people combustion processes after waking up.

The wind was very low during these days and inversions persisted overnight. The air parcel around Petersen school did not move far and based on the nephelometry did not

come from the back ground site even though much of the wind rose shows wind direction from the southeast.

Conclusion

The background levels around Klamath Falls are low and do not show any $PM_{2.5}$ impact on Klamath Falls Petersen School during the days where the Federal Reference Method Sampler measured $PM_{2.5}$ above the NAAQS.