



Real-time DPM Monitoring in Underground Mines


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Goal

- To bring to light some of the factors that affect mine workers' exposure to diesel particulate and identify simple, common sense solutions

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Objectives

- Evaluate the usefulness of the EcoChem Analytics PAS 2000 real-time PAH monitor for airborne DPM sampling
- Use PAS 2000 monitors mounted on diesel vehicles through the work shift for various types of mining tasks
- Look for instances of exposures that could have been lowered by applying simple solutions

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Instruments



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Fitting Instruments to Vehicles



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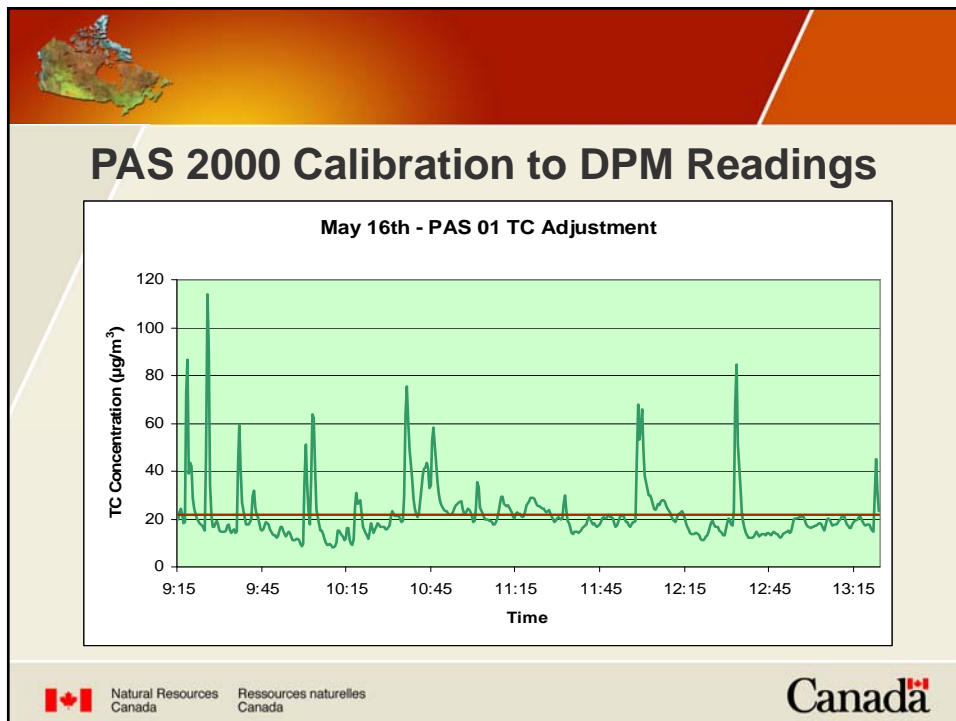
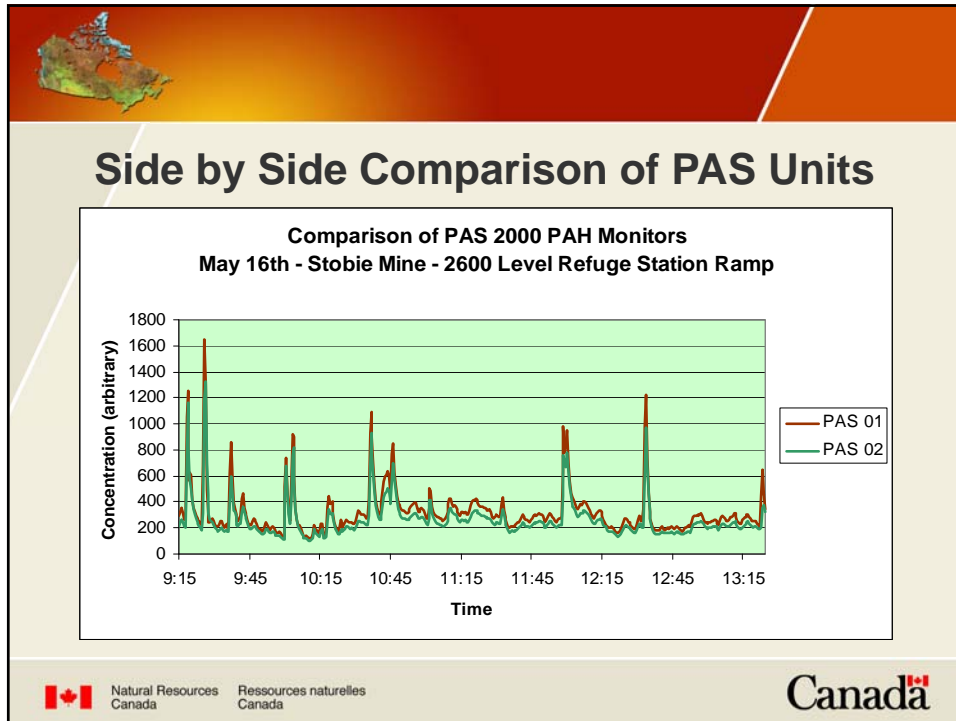


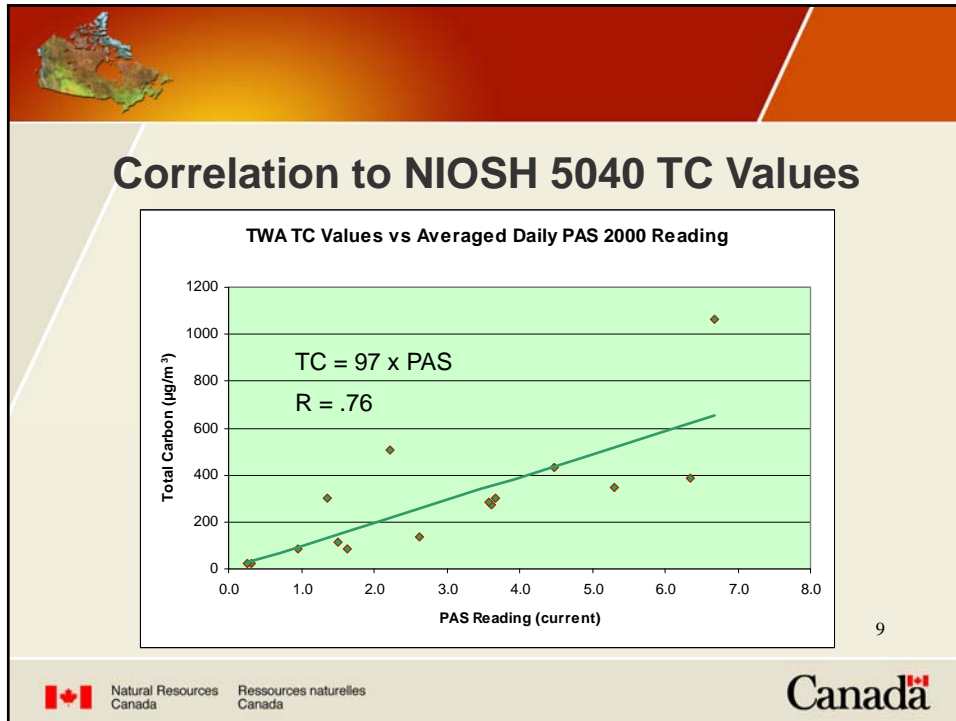

Results

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Measuring Real-time DPM Concentration with the PAS 2000...

- Side by side comparison shows that instrument reacts strongly in the presence of diesel equipment
- Strong linear correlation to NIOSH 5040 total carbon samples
- PAS 2000 cannot measure DPM directly or exactly but is a very good surrogate measurement for real-time monitoring applications (engineering tool)

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Results – Monitoring Mining Activities


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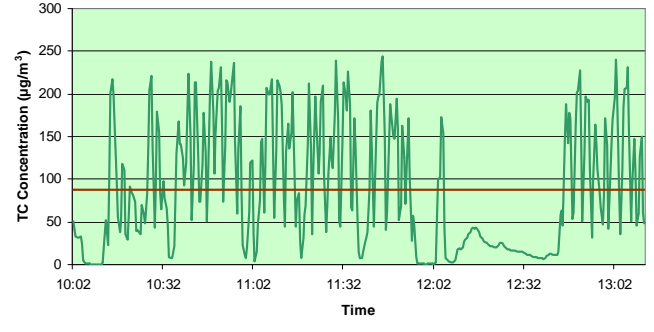




Load-Haul-Dump





May 20th - Toro LHD #099 - 2240 Level

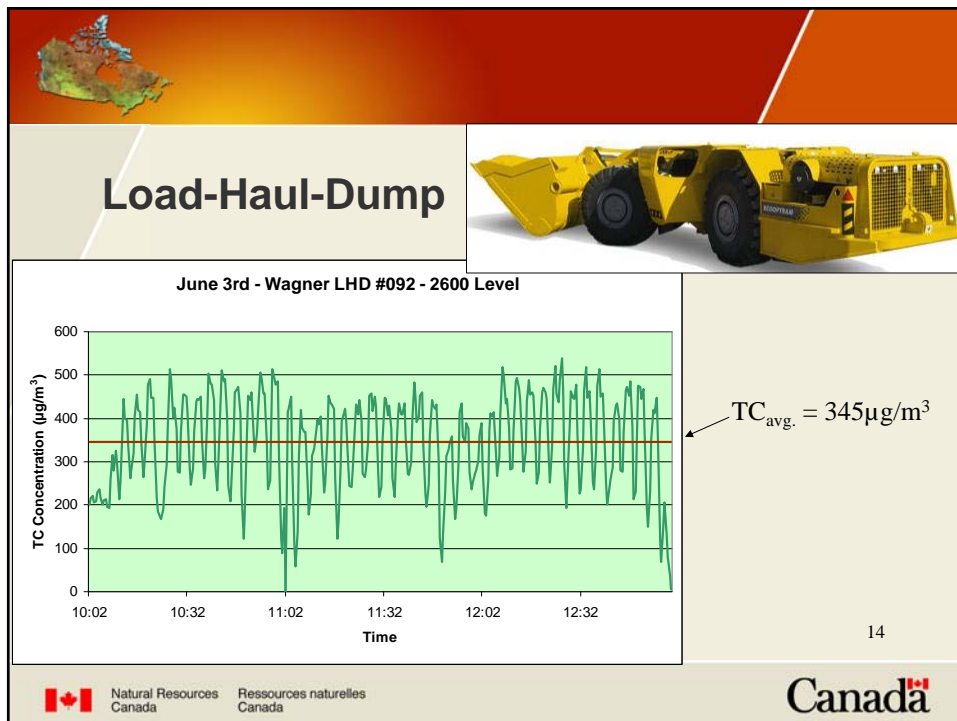
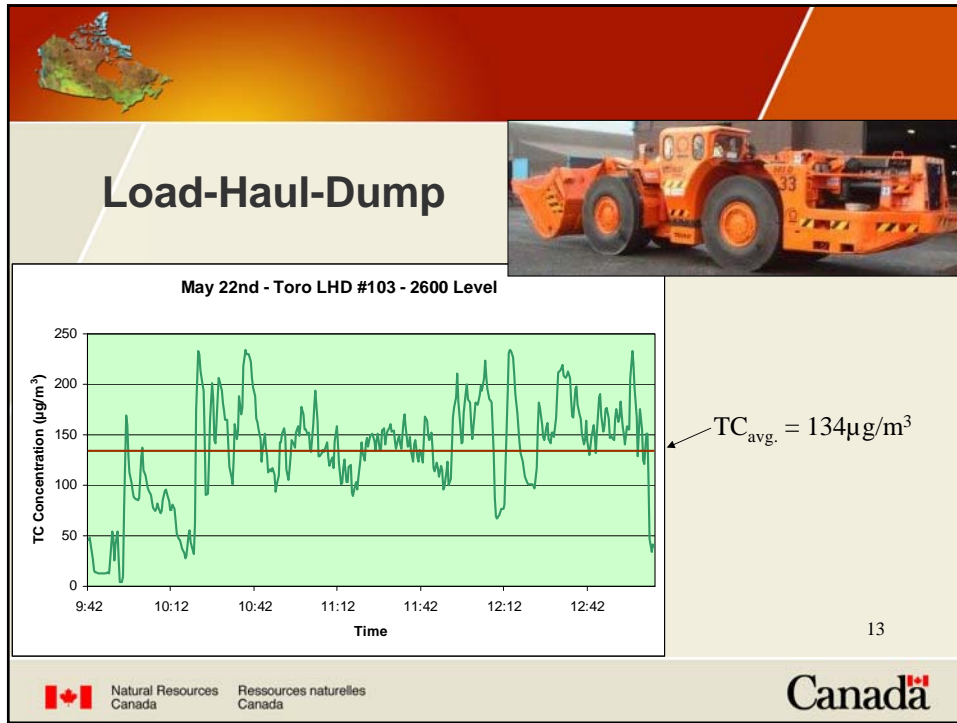


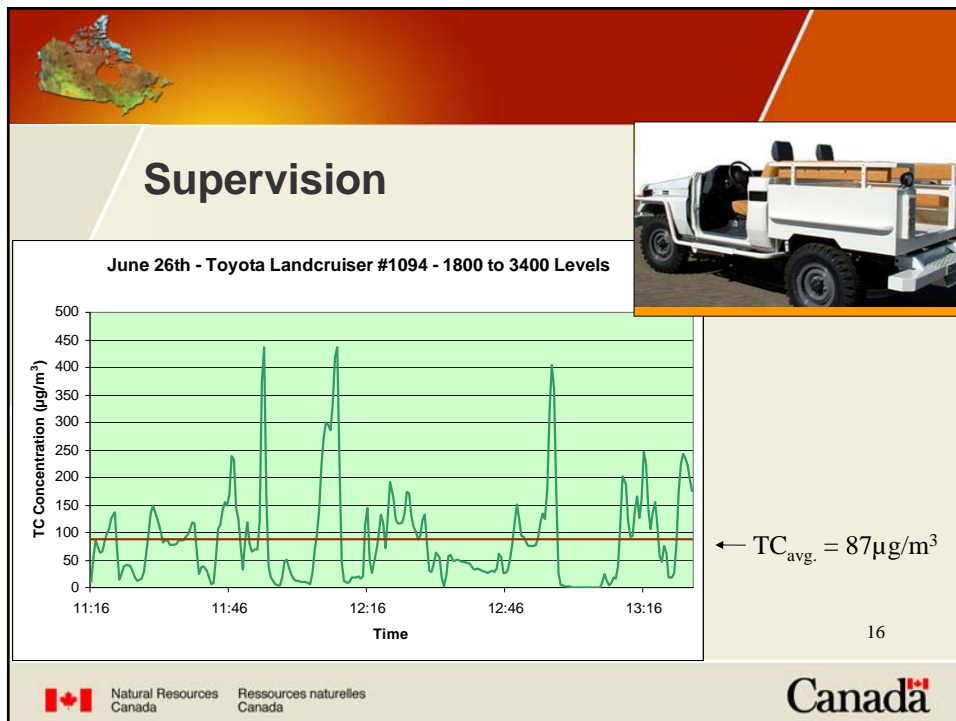
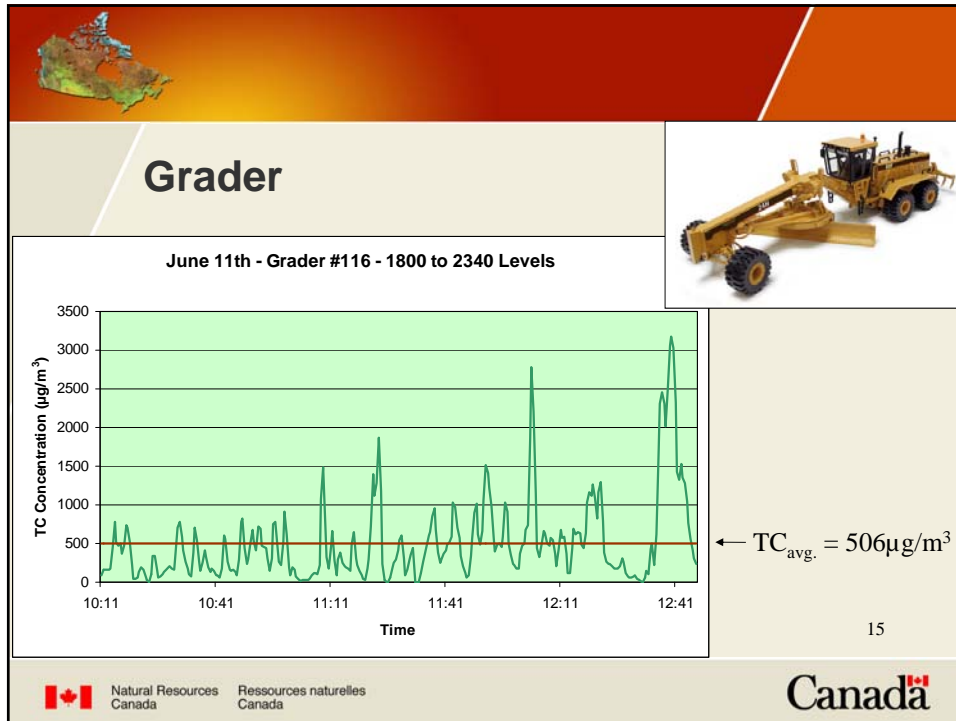
← $TC_{avg.} = 88 \mu g/m^3$

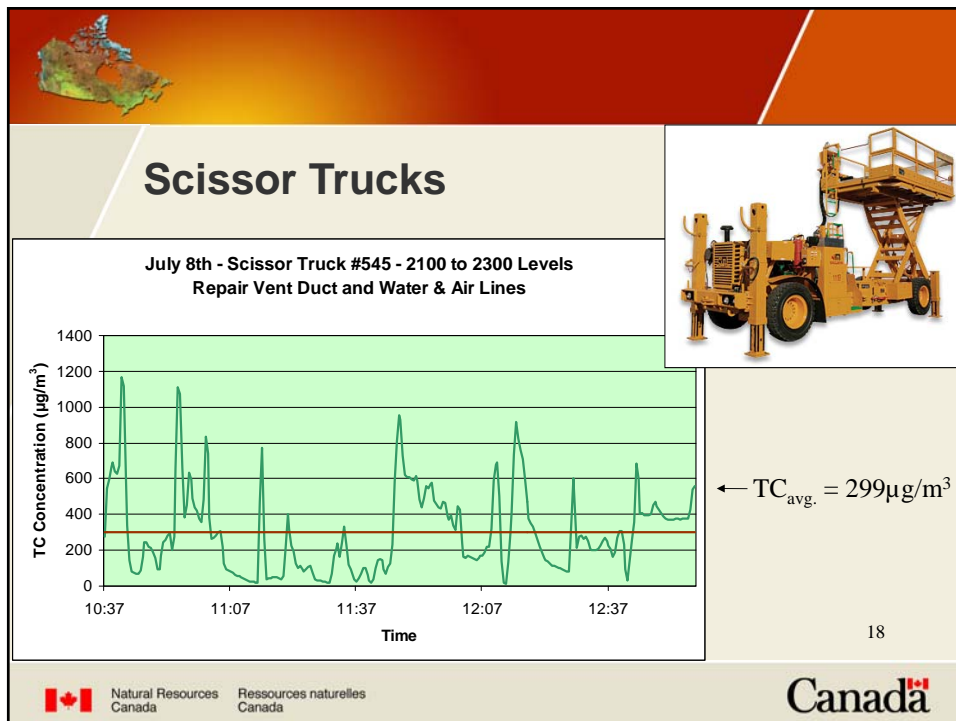
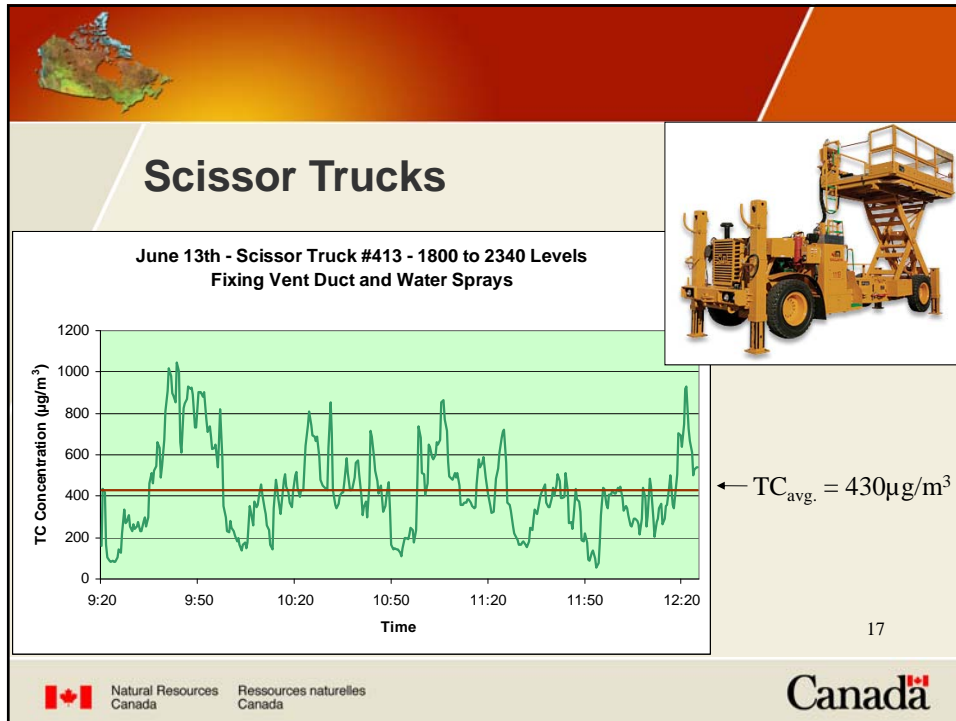
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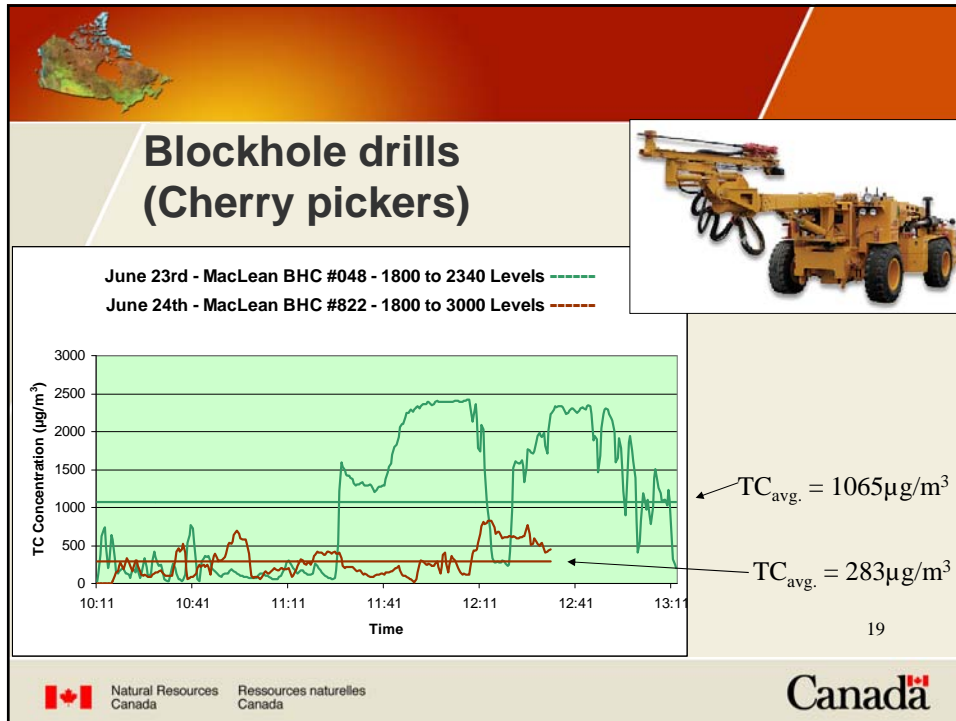

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Findings


- What workers can do for themselves:
 - Make sure vehicles are working properly
 - Limit or eliminate idling (you and others)
 - Before work starts, check that the fan is running, the duct is in good condition and that air is being directed to the heading where diesel equipment is operating (damper position)
 - Whenever possible travel with engine/tailpipe downstream to reduce direct exposure



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Findings

- What the company can do for the worker:
 - Make sure vehicles are properly maintained
 - Ensure ventilation volumes are sufficient to support the number of vehicles in any given area
 - Inspect and maintain auxiliary ventilation infrastructure (fans, regulators, ducts)

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Findings

- What the company can do for the worker:
 - Ensure auxiliary fans are being used and dampers are adjusted to direct air to headings where equipment is operating
 - Make sure that flows and volumes are sufficient
 - Replace old and dirty engines
 - Make workers aware of what they can do for themselves through training

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Conclusion

- TWA sampling is needed for regulatory assessment of worker exposure, but...
- Real-time DPM monitoring is very useful in identifying opportunities for exposure reduction
- PAS 2000 monitor is a good indirect way to measure DPM in real-time
- The next phase of this work will take place at another mining company and will target haulage trucks

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