

# Particulate Monitoring Around Frac Sand Plants Using EPA – Certified Monitors

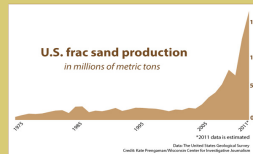
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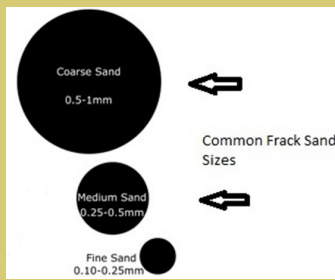
## INTRODUCTION

- Hydraulic fracturing, or fracking, is a popular method for extracting natural gas from shale deposits below the earth's crust.
- The geology of Wisconsin has optimal sand deposits for the process.
- Frac sand is used during extraction as a proppant to hold open the fractured shale during removal of natural gas (3).
- "Freshly-fractured" silica appears to be 2 to 5 times more reactive with animal lung tissue than "weathered" silica, though weathering occurs within several days & with exposure to water.
- Numerous reports of dust accumulation at people's homes & businesses have led to an increased need to investigating air quality surrounding those frac sand facilities.



## Health Impacts

- Fine particles including silica, PM 2.5 lodge deep in the lungs & can enter the bloodstream causing:
  - Damage to alveoli in the lungs.
  - Lung cancer
  - Silicosis;
  - Tuberculosis
  - Kidney disease
  - Autoimmune disease
- Larger sized particles can become lodged in our throats, preventing them from entering the deep lung.

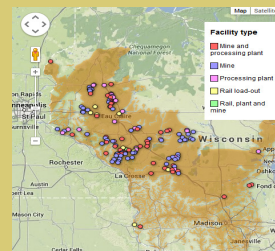


## Hypothesis

The data collected by EPA-certified instruments will continue to reflect concerns with elevated PM2.5 levels from our previous measurements.

## Methods

- 24-Hour ambient air samples were collected at 4 sites in WI and MN with an SKC DPS sampler using the PM<sub>2.5</sub> sampling head.
- 24-Hour ambient air samples were collected in Bloomer WI on 8 dates using an EPA-approved monitor.



## Results

- PM<sub>2.5</sub> levels using the SKC DPS sampler ranged from 5.82–50.8 µg/m<sup>3</sup>.

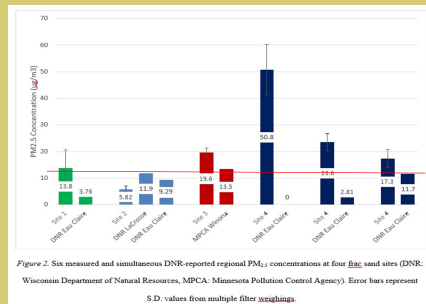
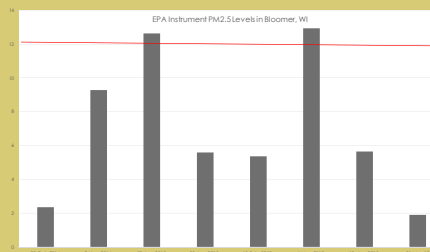


Figure 2. Six measured and simultaneous DNR-reported regional PM<sub>2.5</sub> concentrations at four sites (DNR: Wisconsin Department of Natural Resources, MPCA: Minnesota Pollution Control Agency). Error bars represent S.D. values from multiple filter samplings.

- PM<sub>2.5</sub> levels using the EPA-certified sampler ranged from 1.89–12.9 µg/m<sup>3</sup>.



## Conclusion

- EPA-certified instrument found PM<sub>2.5</sub> levels generally lower than previous SKC DPS levels at other sites, but still with some values above the EPA 12 µg/m<sup>3</sup> annual standard.

## Next Steps

- Compare SKC DPS and EPA-certified instruments side-by-side for 24-hour samples.
- Deploy two new EPA-certified instruments from crowd-sourced funding.



## References

- Pope, C.A., Burnett, R.T., Thun, M.J., Calle, E.E., Krewski, D., Ito, K., & Thurston, G.D. (2002). Lung cancer, cardiopulmonary mortality, and long-term exposure to fine particulate air pollution. *The Journal of the American Medical Association*, 287, 1132-1141. doi:10.1001/jama.287.9.1132.
- Vallyathan, V., Castranova, V., Pack, D., Leonard, S., Shumaker, J., Hubbs, A.F., Shoemaker, D.A., Ramsey, D.M., Pretty, J.R., McClaurin, J.L., et al. (1995). Freshly fractured quartz inhalation leads to enhanced injury and inflammation. Potential role of free radicals. *American Journal of Respiratory and Critical Care Medicine*, 152(3), 1003-9.
- Wisconsin Center for Investigative Journalism. (2013). *Frac sand mines and plants, October 2013 update* [Data file]. Retrieved from <http://www.wisconsinwatch.org/wi-frac-sand/>
- Wisconsin Department of Natural Resources. (2011). *Report to the Natural Resources Board: Silica Study, August 2011, AM-407*. Retrieved from <http://dnr.wisconsin.gov/topic/water/407.pdf>
- Pierce, Crispin H., Kristin Walters, Jeron Jacobson, and Zachary Kroening. PM<sub>2.5</sub> Airborne Particulates near Frac Sand Operations; *J Environ Health*, Featured article Nov. 2015, in press.

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