Public Health Implications of PM_{10} Concentrations Collected near Lambert's Point Coal Terminal

NORFOLK, VA

Letter Health Consultation

July 19, 2017

Virginia Department of Health
Division of Environmental Epidemiology
Richmond, Virginia 23219

COMMONWEALTH of VIRGINIA

Department of Health

MARISSA J. LEVINE, MD, MPH
STATE HEALTH COMMISSIONER

PO BOX 2448
RICHMOND, VA 23218

TTY 7-1-1 OR
1-800-828-1120

July 19, 2017

Demetria Lindsay, MD
District Director
Norfolk City Health District
830 Southampton Ave. Ste. 200
Norfolk, VA 23510

Dear Dr. Demetria Lindsay,

This letter is in response to your request for the Virginia Department of Health (VDH) to examine potential public health implications of particulate matter measuring 10 microns (PM_{10}) and less generated by the Norfolk Southern's Coal Pier in Norfolk, Virginia. Through a cooperative agreement with the Agency for Toxic Substances and Disease Registry (ATSDR), VDH evaluated air monitoring results provided by the Virginia Department of Environmental Quality (DEQ) to determine if PM_{10} is present at levels that could be harmful to the surrounding community.

BACKGROUND AND DISCUSSION

In response to community members' concerns about coal dust originating from Norfolk Southern Railway Company's (NS) operations at Lambert's Point coal terminal NS agreed to operate three PM_{10} ambient air monitors near its Lambert's Point coal pier. Following DEQ approval of the monitoring plan, NS began initial operation of the monitors on August 1, 2015. Monitors were located at the Hampton Roads Sanitary Department's (HRSD) facility to the north of the coal piers and to the east of the NS pier administration building (ADMIN). A second collocated monitor was placed at the HRSD in May 2016. See map in attachment for approximate location of the monitors.

Demographics and community health concerns

Norfolk, VA has a total population of 242,803 according to the 2010 census. Of this population, 114,304 (47.1%) identify as White, 104,672 (43.1%) identify as Black, 16,144 (3.6%) identify as Hispanic, and 7,999 (3.3%) identify as Asian. Children under the age of 5 make up 6.8% of the population. Further, adults between the ages of 18 and 65 make up 79.2% of the population and adults older than 65 make up 9.4 % of the population (U.S. Census Bureau, 2010).

Multiple community members and leaders have expressed concerns about the impact of NS operations, particularly the impact the "loader" has on ambient air quality. Meetings were held with community members, the local health department, DEQ, and VDH to discuss this issue. The importance of monitoring particulate matter measuring 2.5 microns and less ($PM_{2.5}$), PM_{10}, and metal speciation for health impact was discussed. NS voluntarily agreed to PM_{10} ambient air monitoring and it was understood that if PM_{10} results were exceedingly high $PM_{2.5}$ monitoring would be considered. $PM_{2.5}$ is discussed in the attachment.

Environmental monitoring and results

PM_{10} was measured using a Tisch Environmental Model TE-7060V high volume sampler. Samples were collected once every six days, with the sampler operating for a 24-hour period. Pre-weighted filters were collected after the completion of each sampling period and PM_{10} concentration was calculated at the SWA laboratory in Charlottesville, VA. The maximum concentrations reported from August 1, 2015 – July 31, 2016 at ADMIN and HRSD sites were 31.29 and 40.21 $\mu g/m^3$, respectively. The average PM_{10} concentrations reported for ADMIN and HRSD were 14.46 and 17.58 $\mu g/m^3$, respectively.

From May 3, 2016 to August 10, 2016 a collocated sampler was installed at HRSD to measure the instruments precision. Samples were collected every three days until August 10, 2016. During this time frame, 16 valid pairs as defined by DEQ were identified among the collocated samplers. The coefficient of variation between the two samplers was acceptable, 5.5% (less than 10% is considered acceptable).

Table 1: August 1, 2015-July 31, 2016 Results; Twenty-four hour PM_{10} Sampling Results and Comparison Values (all units in $\mu g/m^3$)*****

Sample Location	Average	High	Low	Number of Samples	PM_{10} NAAQS 24 Hr	Number of samples exceeding NAAQS
ADMIN	14.46	31.29	6.58	69	150	0
HRSD	17.58	40.21	4.54	74		0

*(*Source:* DEQ) **PM_{10}**=Particulate Matter 10 micrometer in size or less **NAAQS**=National Ambient Air Quality Standards (not to be exceeded more than once per year on average over three years).

In compliance with quality assurance project plan, quarterly calibrations of the samplers were performed by Simpson Weather Associates (Charlottesville, VA) and the operational integrity of the samplers was further validated by a performance audit conducted by Environmental Standards in June 2016. Most of the Environmental Standards' findings were considered minor and non-serious and inconsequential to the overall concentrations reported at both ADMIN and HRSD sampling sites.

Public Health Implications

When people are exposed to chemicals the exposure does not always result in adverse health effects. The type and severity of health effects that may occur in an individual from contact with contaminants depend on the toxicological properties of the contaminants, how much of the contaminant an individual is exposed, and how often and long the individual is exposed. Once exposure occurs, characteristics such as age, sex, nutritional status, genetics, lifestyle, and health status of the exposed individual influence how the individual absorbs, distributes, metabolizes, and excretes the contaminant. These factors and characteristics influence whether exposure to a contaminant could or would result in adverse health effects (ATSDR 2005).

Particulate Matter (PM_{10})

Particulate matter measuring 10 µm or less are capable of bypassing the body's defense mechanisms (nose, mouth, and throat) that are intended to filter larger particles. These particles can reach deep into the respiratory tract. Additionally, these particles have been associated with increased hospital admissions, exacerbation of asthma, changes in lung function, inflammation, and premature death in individuals with lung and heart disease. PM_{10} are generated by the grinding and abrasion of solids and are usually found near roadways and near industrial sites. In 1987, EPA promulgated a new air quality standard for ambient particulate matter that applies to particulate matter measuring 10 µm or less. This standard limits 24-hour average PM_{10} air concentrations to 150 $\mu g/m^3$. This value is protective of sensitive individuals including asthmatics, the elderly, and children (EPA 2012c).

The concentration of PM_{10} detected in ambient air at both sites is well below the NAAQS PM_{10} standard which is protective of sensitive individuals including asthmatics. The concentrations are also consistent with PM_{10} monitoring from across Virginia (see attachment).

Limitation to evaluating health

PM_{10} samples were collected to address concerns about coal dust originating from NS. Although a proportion of PM_{10} samples collected may contain $PM_{2.5}$, VDH recognizes the importance of collecting $PM_{2.5}$ samples. $PM_{2.5}$ samples are preferred to fully understand the impact particulate matter may have on health.

CONCLUSION

Exposure to PM_{10} near the sampling sites in Norfolk, VA, is not expected to harm people's health because the average concentration and the highest concentration reported for PM_{10} are below the NAAQS.

RECOMMENDATION

VDH recommends that the air quality results and associated conclusions be provided to the community.

I trust that the above information will be of help to you. Should you have any additional questions, or need assistance with community communications, please contact the VDH Division of Environmental Epidemiology at (804) 864-8182 or at 109 Governor Street, Richmond, VA 23219.

Dwight Flammia, Ph.D.
State Public Health Toxicologist
Virginia Department of Health
109 Governor Street
Richmond, VA 23219

This report was supported in part by funds provided through a cooperative agreement with the Agency for Toxic Substances and Disease Registry, U.S. Department of Health and Human Services. The findings and conclusions in these reports are those of the author(s) and do not necessarily represent the views of the Agency for Toxic Substances and Disease Registry or the U.S. Department of Health and Human Services. This document has not been revised or edited to conform to agency standards.

Attachments

Map of Norfolk Southern Coal Pier and approximate location of monitoring stations.

HRSD = HRSD monitoring station. ADMIN = ADMIN monitoring station

PM10 Monitoring Results from Across the State

PM10 sample results from Norfolk and other sites in VA are provided for comparison in the tables below.[1]

2013-2015 PM_{10} 24-Hour Average Concentrations (units in µg/m^3)

Site	2013		2014		2015		>150 µg/m^3
	1st Max	2nd Max	1st Max	2nd Max	1st Max	2nd Max	
(23-A) **Carroll Co.**	34	22	19	19	38	26	0
(134-C) **Winchester**	21	19	19	17	33	23	0
(72-M) **Henrico Co.**	26	22	26	23	40	27	0
(154-M) **Hopewell**	23	19	26	22	25	22	0
(82-C) **King William Co.***	27	22	29	24	32	27	0
(179-K) **Hampton**	22	19	25	18	27	26	0
(181-A1) **Norfolk**	29	21	45**	23	24	24	0
(130-E) **Fredericksburg**	29	21	26	21	29	27	0

***Did not meet completeness criteria for 2014. ****Max influenced by construction activity. **Standard for PM10:** 24-hour concentration not to exceed 150 µg/m^3 more than once per year averaged over three years.

The location of the Norfolk sampling site in the above table.

STATION NUMBER	POLLUTANTS	LOCATION	EPA ID	CITY/COUNTY	LAT/LONG
181-A1	CO, SO_2, NO_2, PM10, PM2.5	NOAA Property 2nd and Woodis Avenue	51-710-0024	Norfolk	36.85555 -76.30135

[1] http://www.deq.virginia.gov/Portals/0/DEQ/Air/AirMonitoring/Annual_Report_2015.pdf last accessed June 2017.

$PM_{2.5}$ Discussion

While PM_{10} can cause lung irritation and aggravate lung conditions such as asthma and COPD, $PM_{2.5}$ pose the greatest health concern because they can penetrates deeply into the lungs and contributes to lung cancer and cardiovascular disease. $PM_{2.5}$ has been found to come primarily from burning coal, fuel oil, or wood, from combustion engines, or from finely pulverized rock or soil.[2] This final component is the crustal component, and has not been found to be associated with mortality.

Most previous studies of $PM_{2.5}$ in relation to coal dust have looked at concentrations in mines, where blasting may produce tiny particles not encountered at Lambert Point, or at concentrations near roadways where coal is being transported by truck.[3] In the latter case the major contributor to $PM_{2.5}$ has been found to be diesel exhaust. The particles produced at Lambert Point likely fall in the range produced for most fragmentation of rock, $PM_{2.5\text{-}10}$.

[2] F. Laden, L.M. Neas, D.W. Dockery, and J. Schwartz. Association of Fine Particulate Matter from Different Sources with Daily Mortality in Six U.S. Cities. Environ. Health Persp. 108, pp. 941-47, (**2000**).

[3] W.R. Reed and J.A. Organiscak. Evaluation of dust exposure to truck drivers following the lead haul truck. Article accessed in June 2017 at www.cdc.gov.