Community Air Monitoring Project

Summary Report – Thomas-Dale Neighborhood

Project overview

In 2013, the Minnesota Legislature funded a two-year air monitoring study to measure air quality in Minnesota communities where low income or communities of color might be disproportionately impacted by pollution from highway traffic, air traffic, and industrial sources. This legislation funds one monitor to be moved to seven locations in a two-year period.

The project began on October 1, 2013 with monitoring in the East Phillips Neighborhood of Minneapolis. The monitor was then moved to the Thomas-Dale neighborhood. This area is a mix of residential and business interlaced with heavily used roadways. Monitoring ran from January 1-March 31, 2014.

Thomas-Dale Neighborhood Air Monitoring Site

What we monitored

Air was monitored for specific chemicals that are associated with adverse public health effects (Attachment A). These chemicals are classified as fine particles ($PM_{2.5}$) or air toxic pollutants (carbonyls, metals or volatile organic compounds). The data collected were examined to see if any results were above air quality standards or health benchmarks.

The data were compared with other data collected in the same time period at other monitors in Minnesota. Within each comparison group, the Minnesota Pollution Control Agency (MPCA) looked for results that were significantly different and had average daily values above air quality standards and health benchmarks.

Findings at a glance:

- All average daily $PM_{2.5}$ values were below the daily $PM_{2.5}$ standard of 35 micrograms per cubic meter ($\mu g/m^3$).
- Average daily $PM_{2.5}$ values measured at the Thomas-Dale monitor were generally higher than the values seen at most other sites for a majority of the monitoring days but followed a similar daily trend as other metro sites. The Minnesota Pollution Control Agency continues to examine metro area $PM_{2.5}$ values to better understand values and trends.
- Of the 74 air toxic pollutants measured for this project, the levels of 42 pollutants were so low that they were not detected by the monitor.
- Air toxic values were all below health benchmarks except formaldehyde. The average daily value of formaldehyde at this site and other fixed monitoring sites in the metro sites were slightly above health benchmarks.

Summary of results

Fine Particles ($PM_{2.5}$)

Fine particulate matter is a mixture of very small particles found in the air including dust, dirt, smoke and even small liquid droplets. Some are so small; they can only be detected with a microscope. Because of their small size, fine particles can become lodged in the lungs and cause health problems.

U.S. Environmental Protection Agency (EPA) regulations state that a monitored site meets daily $PM_{2.5}$ regulatory requirements if the 98th percentile of the 24-hour $PM_{2.5}$ concentrations in a year, averaged over 3 years, is less than or equal to 35 $\mu g/m^3$. For more information: http://www.epa.gov/ttn/naaqs/standards/pm/s_pm_index.html

Regulatory standards exist for fine particle measurements, but these standards require a monitoring period of three years or greater. The monitoring period for this project is too short to consider regulatory compliance for safe $PM_{2.5}$ levels. However, as an informal comparison, for all days, the average daily $PM_{2.5}$ values were below the daily regulatory $PM_{2.5}$ standard of 35 $\mu g/m^3$.

The average daily trends (**Figure 1**) over the three month period were similar between the Thomas-Dale monitor and nearby Minneapolis monitors (Figure 2). While all average daily $PM_{2.5}$ values were below the daily $PM_{2.5}$ standard of 35 $\mu g/m^3$, average daily values measured at the Thomas-Dale monitor were generally higher than those seen at most other sites for a majority of the monitoring days (**Table 1**).

Figure 1. Average daily $PM_{2.5}$ values at all St. Paul-Minneapolis sites from January 1-March 31, 2014.

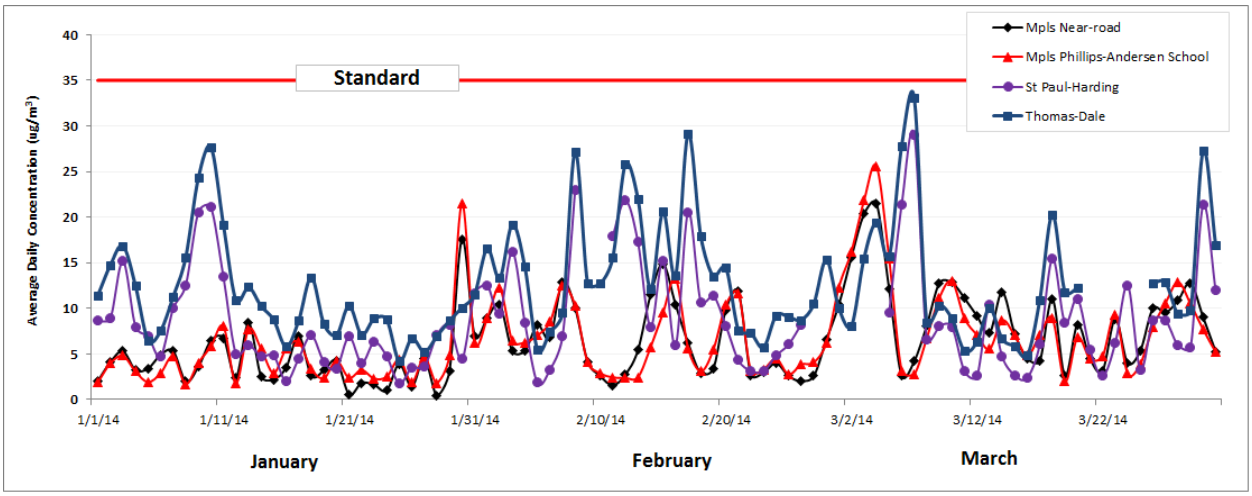


Figure 2. Location of the roving air monitor in relation to other $PM_{2.5}$ air monitors in the St. Paul - Minneapolis metro area. For more information about the individual sites, please visit the MPCA Air Monitoring Network Plan website (www.pca.state.mn.us/pyrifa3).

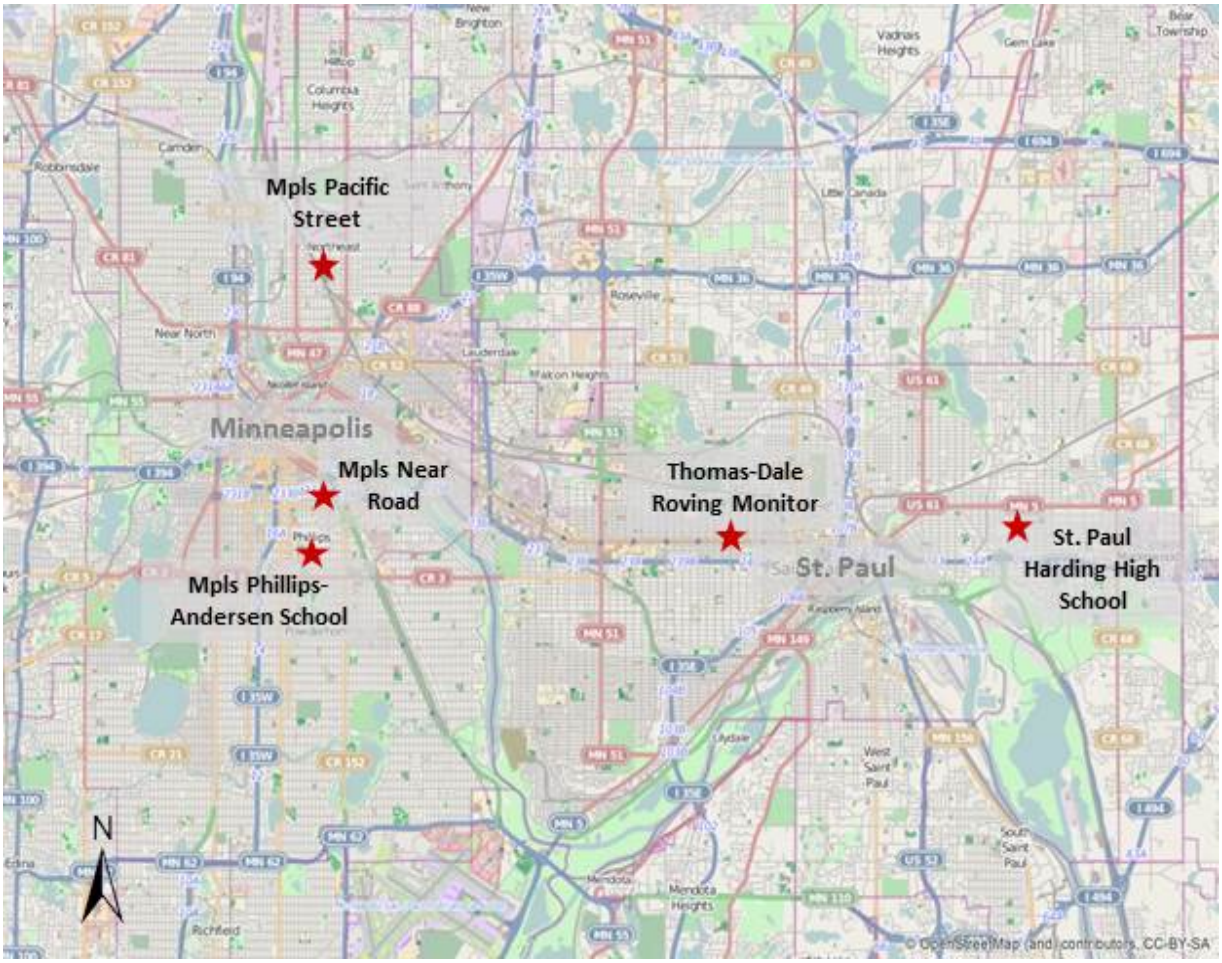


Table 1. Summary information describing average daily PM2.5 values found at MPCA monitors during the monitoring period of January 1 – March 31, 2014.

Site	Min $\mu g/m^3$	Max $\mu g/m^3$	Mean[1] $\mu g/m^3$	Median[2] $\mu g/m^3$	Standard Deviation* $\mu g/m^3$	Number of days that concentration values at Thomas-Dale were higher	Number of days that concentration values at Thomas-Dale were lower	Total Number of Monitoring Days[+]
Thomas-Dale	4.2	33.1	12.7	11.0	6.4			
Mpls NearRoad	2.0	33.2	9.3	8.3	5.4	67	13	80
Mpls Pacific Street	0.2	30.8	7.9	5.5	6.7	78	4	82
Mpls Phillips	0.5	28.8	7.0	5.4	5.7	84	1	85
St. Paul-Harding High School	1.8	29.0	8.8	7.1	5.9	72	5	77
Anoka Airport	1.8	25.4	8.3	6.9	5.4	74	0	74
Apple Valley	2.0	28.8	8.2	6.6	5.3	83	1	84
Virginia	6.1	24.2	10.6	9.6	3.4	50	35	85
Rochester	1.8	36.3	8.6	6.6	5.8	75	6	81
Talahi School	2.3	29.3	8.3	6.9	5.4	84	1	85
St Michael	0.5	30.1	7.0	5.7	5.4	80	1	81
Detroit Lakes	2.2	34.0	7.0	6.0	4.6	70	3	73
Marshall	0.8	38.6	6.7	4.8	6.5	79	6	85
Duluth-Laura McA School	0.8	20.3	6.0	5.0	4.2	81	1	82
Ely	1.0	13.6	3.9	3.2	2.4	81	0	81
Brainerd Airport	0.4	22.2	5.1	3.6	4.9	85	0	85
Winona	2.5	39.1	10.6	8.4	6.1	64	18	82

[1]Mean value is the arithmetic average value of all of the average daily PM2.5 measurements

[2]Median value is the middle value of the set of average daily PM2.5 measurements

*Standard Deviation of the mean values reported in this table

[+]Not all days had complete data available for analysis

Summary of results (cont'd)

Air toxics

Toxic air pollutants are those chemicals known or suspected to cause serious human health effects or adverse environmental effects. Example pollutants include *methylene chloride*, used as a solvent and paint stripper, *perchloroethylene*, emitted by some dry cleaning facilities and *benzene*, which is found in gasoline. Some toxic air pollutants are metals such as *cadmium*, *chromium*, or *lead* compounds.

Air toxics health benchmarks

Existing air quality standards and health benchmarks come from a variety of sources. However, these are not available for all chemicals. For air toxics, the MPCA uses available published health benchmarks. Specific information about standards and health benchmarks can be found at: http://www.pca.state.mn.us/bkzq4b0.

Of the 74 air toxic pollutants measured (**Attachment A**), there were 32 pollutants detected at the Thomas-Dale monitor.

Compared to values at other fixed monitoring sites around the state and in the Twin Cities metropolitan area (**Figure 3**), the majority of these chemicals did not significantly* differ in measured values (**Figure 4**). The only air toxic pollutant found above a health benchmark was formaldehyde. The average values of some of the detected chemicals at Thomas-Dale were lower than those seen at other monitors.

*Kaplan-Meier non-parametric non-detects data analysis

MDH

Minnesota Public Health Data can be found at https://apps.health.state.mn.us/mndata/home

This data can be searched by county to help you find public health information relevant to your local area.

Figure 3. Location of the roving air monitor in relation to other fixed site air toxics monitors in the St. Paul-Minneapolis metro area.

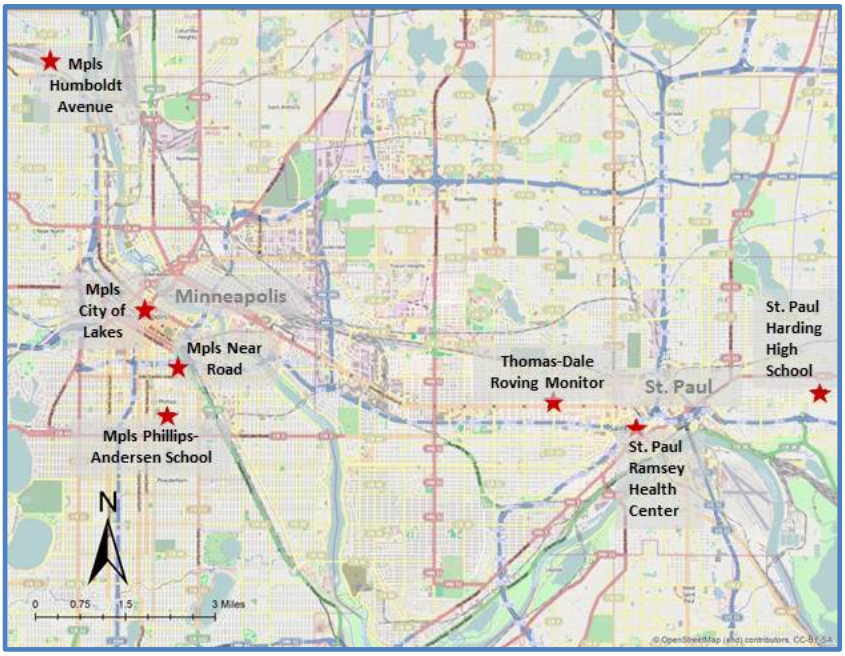
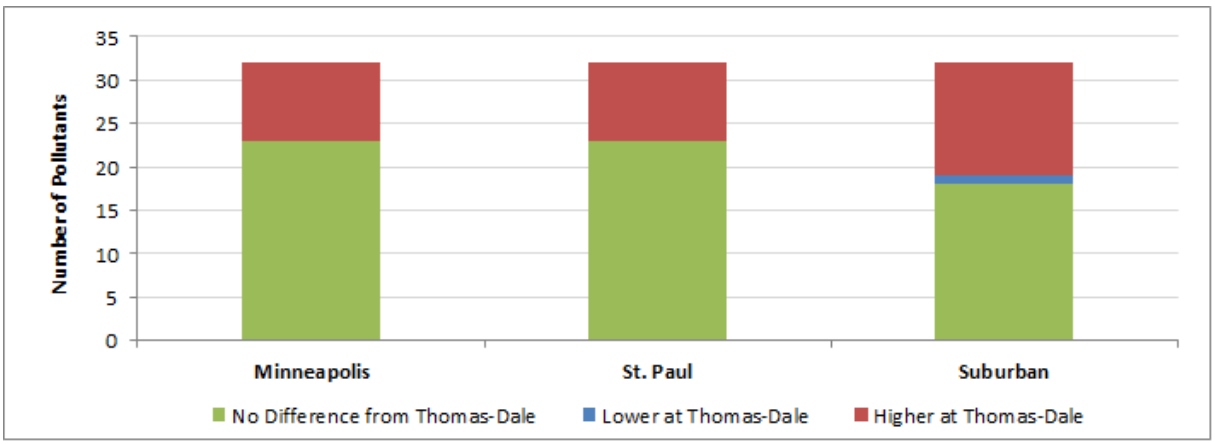


Figure 4. The number of air toxic pollutants that had a statistically* different average value than was seen at other monitors around the Twin Cities.



*Kaplan-Meier non-parametric non-detects data analysis

Formaldehyde

Formaldehyde is produced from human-made and natural sources. A variety of volatile organic compounds also react in the atmosphere to indirectly form formaldehyde. Direct emissions of formaldehyde in Minnesota come primarily from wildfires and prescribed burning, gasoline and diesel burning highway and off-highway vehicles, residential fuel combustion and industrial processes.

As temperatures increase in the spring and summer, indirect sources of formaldehyde can be greater than direct sources and average values of formaldehyde typically go up. This increase in formaldehyde was seen at this community monitoring site as well as across other Twin Cities monitoring sites (**Figure 5**). The 3-month formaldehyde average was over the long-term health benchmark of 2 $\mu g/m^3$ for the three month monitoring period at most metro sites (**Table 2**). Since formaldehyde concentrations vary over the calendar year, the annual average is not known. The MPCA is working to better understand the sources of formaldehyde in Twin Cities' air.

Figure 5. Formaldehyde values measured during the three month monitoring period.

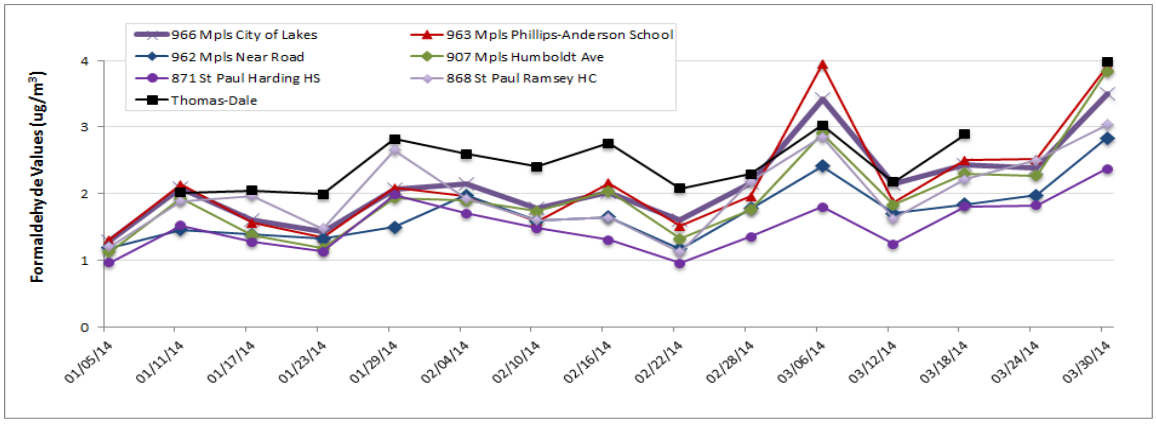


Table 2. Formaldehyde values ($\mu g/m^3$) measured at the Thomas-Dale roving monitor and metro area fixed air monitors during the monitoring period of January 1 – March 31, 2014.

		St. Paul		Minneapolis			
		Ramsey County	Harding	Humboldt		Phillips-	City of
	Thomas-Dale	Health Center	High School	Avenue	Near Road	Anderson School	Lakes
01/05/14	*	1.2	1.0	1.1	1.2	1.3	1.3
01/11/14	2.0	1.9	1.5	1.9	1.5	2.1	2.1
01/17/14	2.1	2.0	1.3	1.4	1.4	1.6	1.6
01/23/14	2.0	1.5	1.1	1.2	1.3	1.3	1.4
01/29/14	2.8	2.7	2.0	1.9	1.5	2.1	2.1
02/04/14	2.6	1.9	1.7	1.9	2.0	2.0	2.2
02/10/14	2.4	1.6	1.5	1.7	1.6	1.6	1.8
02/16/14	2.8	1.6	1.3	2.0	1.6	2.2	2.0
02/22/14	2.1	1.1	1.0	1.3	1.2	1.5	1.6
02/28/14	2.3	2.2	1.4	1.8	1.8	2.0	2.2
03/06/14	3.0	2.9	1.8	2.9	2.4	3.9	3.4
03/12/14	2.2	1.6	1.2	1.8	1.7	1.9	2.2
03/18/14	2.9	2.2	1.8	2.3	1.8	2.5	2.4
03/24/14	*	2.5	1.8	2.3	2.0	2.5	2.4
03/30/14	4.0	3.0	2.4	3.8	2.8	3.9	3.5
Mean[+]	2.5	2.0	1.5	2.0	1.7	2.2	2.1
	*Data not collected these days						
	[+]The mean value is the arithmetic average value of all of the values in the respective column						

What you can do to reduce your exposure to air pollutants

To reduce your risk of developing bad health from exposures to air pollution:

- Avoid exposure to tobacco smoke, wood smoke, vehicle exhaust, and other sources of airborne particles.
- Avoid prolonged outdoor exertion near high-traffic areas.
- Stay informed about air pollution alerts and advisories in your area by visiting the MPCA Air Quality Index website (www.pca.state.mn.us/d8dcwpp), calling the AQI Information Line (651-297-1630) or subscribing to the MPCA Air Quality Forecast Alert system (http://mn.enviroflash.info/).
- If you experience respiratory or cardiovascular symptoms (e.g., persistent cough, burning eyes, wheezing, shortness of breath, tightness of chest, or chest pain) on air quality alert days, consult with a health care professional, as needed. Pay particular attention if you are an athlete, or if you or your children have a respiratory or cardiovascular condition.
- Work together with others in your community to improve air quality (see website links below for more information).

Links to other information

Information about other environmental hazards, health outcomes, and socioeconomic indicators is available from the U.S. EPA at http://epamap14.epa.gov/ejmap/entry.html. You can search for information by address at this website.

For tips on how to reduce air pollution, please visit http://epa.gov/oaqps001/peg_caa/reduce.html.

For more information about commonly found air pollutants and their sources, please visit http://epa.gov/airquality/peg_caa/cleanup.html.

For more information on the air monitoring results from the Thomas-Dale monitoring site or other air quality monitoring studies, please call 651-296-6300 or 1-800-657-3864 and ask for air data analysis staff. For more information and to view updates about the Community Air Monitoring Project, please visit www.pca.state.mn.us/9xc4ahc.

More information about the MPCA's air monitoring program is available on the Web at http://www.pca.state.mn.us/ruu6fhw.

Attachment A. Community Air Monitoring Project - **Monitored Air Quality Pollutants**

Carbonyls
Acetaldehyde
Benzaldehyde
Butyraldehyde
Formaldehyde
Propionaldehyde
Trans-Crotonaldehyde

Metals
Antimony
Arsenic*
Barium
Beryllium[1]
Cadmium*
Chromium
Cobalt[1]
Iron
Lead
Manganese
Nickel
Selenium
Zinc

PM2.5 Continuous
PM2.5 Concentration

Volatile Organic Compounds
1,1,2,2-Tetrachloroethane[1]
1,1,2-Trichloroethane[1]
1,1-Dichloroethane[1]
1,1-Dichloroethylene[1]
1,2,4-Trichlorobenzene[1]
1,2,4-Trimethylbenzene*
1,2-Dichlorobenzene[1]
1,2-Dichloropropane[1]
1,3,5-Trimethylbenzene[1]
1,3-Butadiene
1,3-Dichlorobenzene[1]
1,4-Dichlorobenzene[1]
Benzene
Benzene, 1-Ethenyl-4-Methyl[1]
Benzyl Chloride[1]
Bromodichloromethane[1]
Bromoform[1]
Bromomethane[1]
Carbon Disulfide
Carbon Tetrachloride
Chlorobenzene[1]
Chloroethane[1]
Chloroform[1]
Chloromethane
Cis-1,2-Dichloroethene[1]
Cis-1,3-Dichloropropene[1]
Cyclohexane
Dibromochloromethane[1]
Dichlorodifluoromethane
Dichloromethane
Ethylbenzene*
Ethylene Dibromide[1]
Ethylene Dichloride*
Freon 113
Freon 114[1]
Furan, Tetrahydro-[1]
Hexachlorobutadiene[1]
M/P Xylene
Methyl Butyl Ketone[1]
Methyl Chloroform[1]
Methyl Ethyl Ketone*
Methyl Tert-Butyl Ether[1]
N-Heptane
N-Hexane
O-Xylene
Propylene
Styrene[1]
Tetrachloroethylene[1]
Toluene
Trans-1,2-Dichloroethylene[1]
Trans-1,3-Dichloropropene[1]
Trichloroethylene[1]
Trichlorofluoromethane
Vinyl Acetate
Vinyl Chloride[1]

[1]Indicates chemicals that were below detection limits at all monitors in Minnesota, including the Thomas-Dale monitor, for this three month monitoring time.
*Indicates chemicals that were below the detection limit at the Thomas-Dale monitor, but were detected at one or more monitoring sites in Minnesota.