2013-2015 Community Air Monitoring Project Final Report

Minnesota Pollution Control Agency

October 2016

Legislative charge

In 2013, the Minnesota Pollution Control Agency was given a statutory requirement (Laws 2013, chapter 114, article 3, section 3, subdivision 3) to monitor ambient air for hazardous pollutants in areas where low-income, indigenous American Indians and communities of color are disproportionately impacted from highway traffic, air traffic and industrial sources.

This final report presents an overview of the results of this project.

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1. Background

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. Project objectives were to: 1) sample community ambient air, 2) analyze results, 3) compare results to ambient air data from the agency's existing air monitoring network and 3) share results with legislators, neighborhood groups, and the general public.

Air was monitored for specific chemicals that are associated with adverse public health effects (Appendix A). These chemicals are classified as fine particles ($PM_{2.5}$) or air toxic pollutants (carbonyls, metals or volatile organic compounds).

For this monitoring study, between October 1, 2013 and December 31, 2015, we monitored nine community locations. Communities to be monitored were chosen based on the criteria identified in the funding legislation. Within the community, actual monitoring locations were selected based on community input and ability to meet monitor siting requirements. Identified communities were monitored for three months with the exception of two sites in Duluth which were each monitored for six months. After the monitoring was done, the monitoring equipment was moved to the next site.

2. Results and discussion

2.1 Results

Results and lessons learned include:

- Comparisons with benchmarks/standards
  - Compared to health benchmarks, formaldehyde was elevated at: St. Paul Thomas-Dale site (1902), St. Paul West Side site (1903) and Minneapolis 28th Street-Greenway Trail site (1904).
  - At the St. Paul West Side site (1903), for April-June 2014, for the seven out of 15 measurements that were above detection limit, the three-month average* arsenic value (0.0046 g/m^3) was above the long-term health benchmark (0.0023 g/m^3).
    *Kaplan-Meier non-parametric non-detects data analysis
- Comparisons to Twin Cities area fixed monitoring sites
  - Fine particle ($PM_{2.5}$) values tended to be slightly higher at the community sites.
  - $PM_{2.5}$ daily behavior was similar between the community monitor and fixed monitors.
  - Normal formaldehyde seasonal concentration variations were seen at the community monitor and fixed monitors.
- Limitations of three-month and six-month (Duluth sites) monitoring
  - Cannot directly compare results between community monitoring sites that were monitored at different times of the year because many pollutant concentrations vary with temperature and other weather changes. For those sites monitored during the same calendar months, no differences of concern are notable.
  - Large uncertainties exist when comparing the short-term community monitor results to long-term standards and benchmarks.
- Overall results
  - With the few stated exceptions above, no large differences in air pollutant concentrations were seen between the community monitored areas and fixed monitors. Current fixed monitoring sites appear to provide reasonable estimates of overall air quality.

2.2 Discussion

Over each monitoring period, average daily fine particle ($PM_{2.5}$) behavior was similar between the community monitor and other Twin Cities area monitors. When average daily $PM_{2.5}$ concentrations went up or down at the community monitor, they usually changed in the same direction as was seen at other Twin Cities monitors. This suggests that there was a uniform influence on fine particle production that occurs across the Twin Cities and was seen in monitored neighborhoods.

With the noted exceptions above, although average daily fine particle values were below national and state standards, a majority of the average daily fine particle values were slightly higher at most of the community monitor sites than seen at other Twin Cities monitors during the respective monitoring period. These higher readings at the community monitor site could be attributed to several factors. First, due to the need to find a temporary monitoring site that meets federal siting criteria, most of the community monitor sites were installed at ground-level rather than on a roof. This ground-level siting results in both a spatially smaller sampling area and more restricted airflow conditions which could result in increased ambient air concentration measurements. Second, due to the periodic movement and installation in the temporary locations, effects on instrument measurements could have been introduced into resulting measurement values. Lastly, slightly higher fine particle averages in the community monitor sites could indicate that these areas are closer to, or, are more impacted by sources of fine particle production.

Expected pollutant behavior was seen at the community monitor. For example, formaldehyde is known to increase in warmer months. This behavior was seen at Twin Cities fixed monitor sites and in much of the community monitored data. For the sites where formaldehyde was not reported as elevated, average formaldehyde levels were close to the long-term health benchmark (2 g/m^3). MPCA is working to better understand what contributes to the formation of formaldehyde.

With noted exceptions, most air toxic pollutant values were not different between the community monitor site and other Twin Cities monitors. At the St. Paul West Side monitoring site, most of the three-month average air toxics metals values were slightly higher than any of the other sites around the Twin Cities. This suggests that this site was being more impacted by a source of air toxic metals. At this site, within the monitored metals, the three-month average arsenic value was above the long-term health benchmark. In response to these findings and community concerns, the MPCA has returned to the St. Paul West Side area to monitor levels of metal particles in the community ambient air. This monitor has been placed in the southeast area of the St. Paul Holman Field Downtown Airport. Monitoring started the first week of January 2016 and will continue for at least one year.

3. Community outreach

One goal of this project was to inform community organizations about the community monitoring at the beginning, during and after the monitoring. To this end, MPCA staff interacted and communicated with Twin Cities environmental justice groups, neighborhood organizations, concerned citizens, and municipal community staff. Two project team members, Ned Brooks and Mary A. Williams, attended a community meeting at the Little Earth Residential Complex to present and discuss findings in that community. Kari Palmer, Melissa Sheffer and Mary A. Williams attended a St. Paul West Side Sustainable Living community meeting to present and discuss findings in that community. Ned Brooks and Kari Palmer attended a meeting with a St. Paul Payne-Phalen community group to discuss findings in that community.

Two summary reports were produced for each monitoring site: a short two-page summary overview of the community monitoring results and a longer report providing summary tables of air monitoring results. These reports were shared with community contacts and posted on the dedicated MPCA website. MPCA staff offered to meet with any interested community groups to discuss the findings.

Project information has been published in multiple community newspapers and on a dedicated MPCA website: https://www.pca.state.mn.us/air/community-air-monitoring-project. MPCA staff promoted project information via the MPCA Air Mail listserv (https://www.pca.state.mn.us/air/air-mail-newsletter-and-bulletins).

4. Community monitor sites

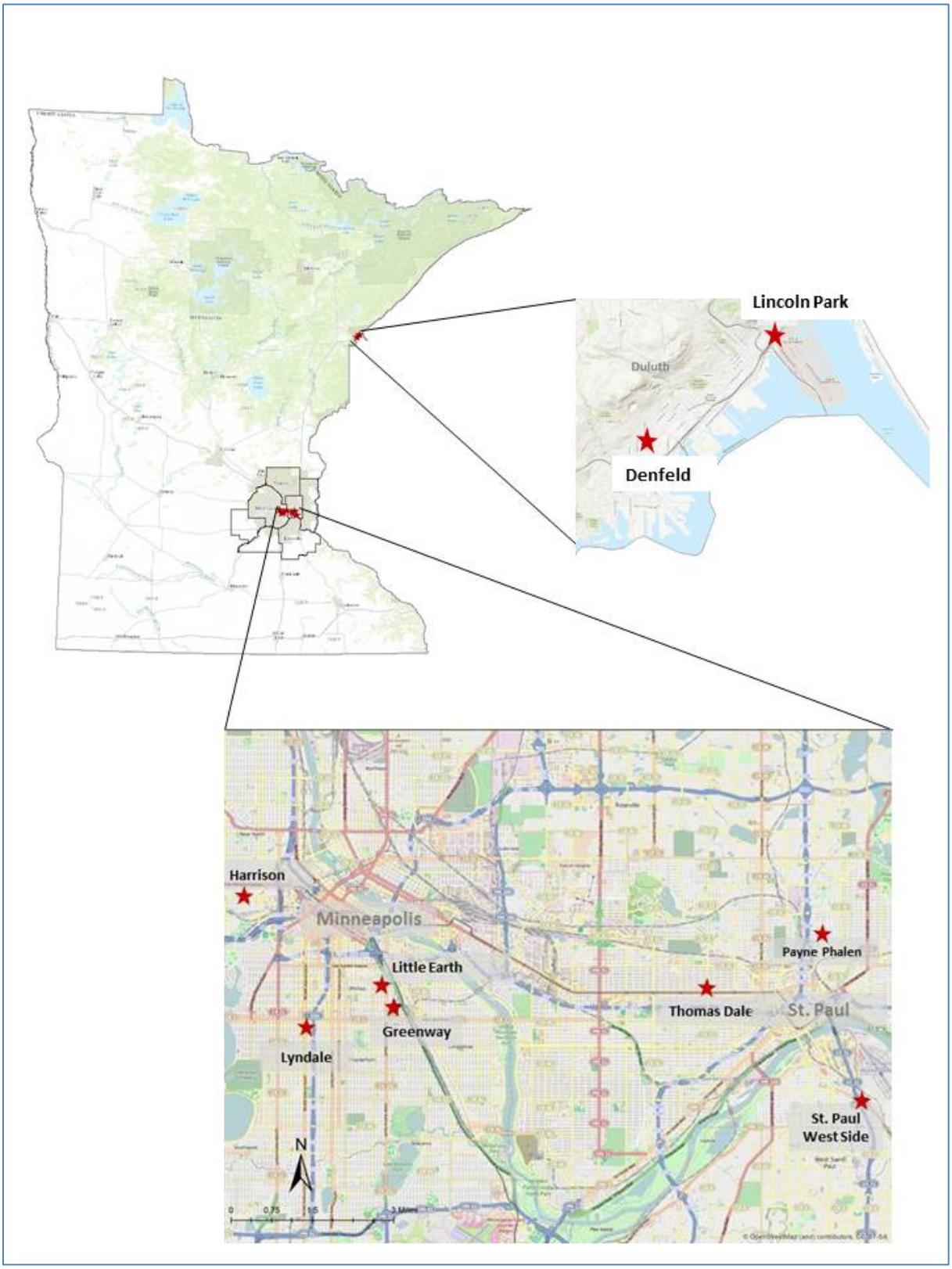
4.1 Community monitor locations

This community monitoring project began on October 1, 2013 with a three month monitoring period in the East Phillips, Little Earth community in Minneapolis. Between the project start date and the end of 2015, nine community sites were monitored (**Table 1; Figure 1**).

Table 1. 2013-2015 community air monitoring project monitor locations.

	MPCA Site ID	EPA AQS ID	Dates of Monitoring	Location	Address
1	1901	27-053-1901	Oct-Dec 2013	Minneapolis - Little Earth Community	2438 18th Avenue South, Minneapolis, MN
2	1902	27-123-1902	Jan-Mar 2014	St. Paul - Thomas-Dale Frogtown Community	533 North Dale Street, St. Paul, MN
3	1903	27-123-1903	Apr-Jun 2014	St. Paul - West Side Community	401 Concord Street, St. Paul, MN
4	1904	27-053-1904	Jul-Oct 2014	Minneapolis-Greenway-28th Avenue	Intersection of East 28th and Midtown Greenway
5	1905	27-053-1905	Oct-Dec 2014	Minneapolis - Harrison Community	1600 Glenwood Avenue, Minneapolis, MN
6	1906	27-053-1906	Jan-Mar 2015	Minneapolis - Lyndale Community	3101 Nicollet Avenue, Minneapolis, MN
7	1907	27-123-1907	Apr-Jun 2015	St. Paul - Payne-Phalen Community	409 Case Avenue, St. Paul, MN
8	7549	27-137-7549	Jul-Dec 2015	Duluth - Lincoln Park Community	1532 W Michigan St, Duluth, MN
9	7554	27-137-7554	Jul-Dec 2015	Duluth - Denfeld - Community	720 N Central Ave, Duluth, MN

Figure 1. Spatial locations of the 2013-2015 community air monitoring project monitors.



4.2 How sites were chosen

Multiple factors were used in deciding what community and where in the community the monitor should be placed.

- **Mapping from legislative language**

  MPCA staff compiled a list of data sources from the legislative language:

  "*Low income*": (median household income, US Census 2010)
  "*Communities of color*": (percent non-white, US Census 2010)
  "*American Indian*": (percent American Indian Non-Hispanic, US Census 2010)
  "*Highway traffic*": (MNRiskS results for on-road air pollution sources)
  "*Air traffic*": (MNRiskS results for all sources including airport vehicles, airplane related emissions, and minor and major roadways in and around the airports)
  "*Industrial sources*": (MNRiskS results for all sources)

  MPCA staff ranked results from the Minnesota Cumulative Risk Model (MNRiskS) for air pollution estimates. All air pollutant sources were included. Median household income, American Indian non-Hispanic and non-white populations from the US Census were ranked next. Air pollution and socioeconomic status were combined into one index. Air pollution was given equal weight as socioeconomic status. Finally, these indices were mapped to illustrate priority areas for placing monitors. The top 100 locations were given highest priority. The top 100 final summed ranks included locations in Duluth and the Twin Cities.

- **Air monitoring platform considerations**

  As part of the data analysis for the community monitor measurements, the results were to be compared with measurements from existing ambient air monitoring sites. In order for this to be possible, the community air monitoring sites, like existing sites, had to meet all siting criteria established by the U.S. Environmental Protection Agency (EPA) described in EPA document CFR 40 Part 58 Appendix E.

- **Stated concern and interest from community leaders and members**

  MPCA staff and management had previously heard comments at public meetings and read written comments about spatial areas of concern for higher levels of air pollution. This existing knowledge was taken into consideration in siting decisions.

- **Community input**

  Community and local government input were considered in determining final siting locations for monitors.

5. Air quality standards and health benchmarks

Pollution concentrations are typically compared to standards and health benchmark values designed to relate concentrations with human health risks. These standards and benchmarks have been designed to be compared with pollution concentrations measured over one or more years. Therefore, because each monitoring period is conducted over a three-month time frame, direct comparisons between monitoring results and standards or benchmarks cannot be made. Instead, we made comparisons with standards and benchmarks to provide a sense of what monitoring results might mean if those results had been seen over a couple of years or more of monitoring.

5.1 EPA National Ambient Air Quality Standards (NAAQS) and Minnesota Ambient Air Quality Standards (MAAQS)

The Clean Air Act requires the EPA to set primary and secondary air quality standards. Primary health standards are established to provide public health protection. Secondary standards include protection against decreased visibility and damage to vegetation, animals and buildings. In response, the EPA developed the NAAQS for a set of six principal pollutants including lead and fine particles ($PM_{2.5}$). Each standard requires local conditions to be averaged over a specific time. For fine particles, there are different standards dependent upon the averaging time (**Table 2**).

In addition to the national standards, the MPCA has established state-level MAAQS (**Table 2**).

Table 2. National and state ambient air standards related to parameters measured in the community air monitoring project.

Pollutant	Parameter Code	Standard	Primary or Secondary	Averaging Time	Standard Value	Unit	Notes
$PM_{2.5}$	88101	**NAAQS**	Primary	Annual (1 year*)	12	ug/m3	Annual mean, averaged over 3 years
			Secondary	Annual (1 year*)	15	ug/m3	Annual mean, averaged over 3 years
			Primary & Secondary	24 hour	35	ug/m3	98th percentile, averaged over 3 years
		MAAQS	Primary & Secondary	24 hour	65	ug/m3	24-hour avg value; standard is attained when the 98th percentile 24-hour value is less than or equal to the standard
			Primary & Secondary	Annual (1 year*)	15	ug/m3	Annual arithmetic mean; the standard is attained when the expected annual arithmetic mean value is less than or equal to the value of the standard
Lead (Pb)	14129	**NAAQS**	Primary & Secondary	Rolling 3-months	0.15	ug/m3	Not to be exceeded, evaluated over a three-year period
		MAAQS	Primary & Secondary	Calendar Quarter	1.5	ug/m3	Arithmetic mean, averaged over a calendar quarter

*Calendar Year

5.2 Inhalation health benchmark values

Inhalation health benchmark (IHB) values have been established as pollutant-specific standards that are designed to protect public health against short and long-term air pollution exposure. An acute (short-term) IHB is a level of chemical concentration in ambient air which, if at or below that level, the chemical is unlikely to cause an adverse health effect when exposure occurs for one hour. A chronic (long-term) IHB is a level of chemical concentration in ambient air which, if at or below that level, the chemical is unlikely to cause an adverse health effect if exposed to this concentration over a lifetime. Chronic IHBs are set for cancer and non-cancer health effects. In this project, for those pollutants with a non-cancer and chronic cancer health benchmark, the most stringent health benchmark was used for comparisons (Appendix B). Note that not all pollutants have health benchmark values.

Air quality standards and public health benchmarks come from a variety of sources including the Minnesota Department of Health, the EPA and the California Office of Health Hazard Assessment. For air toxics, the MPCA uses available published health benchmarks (Appendix B). More information about standards and health benchmarks can be found at: https://www.pca.state.mn.us/air/air-toxics-minnesota.

6. Monitored pollutants

Air was monitored for specific chemicals that are associated with adverse public health effects (Appendix A). These chemicals are classified as fine particles ($PM_{2.5}$) or air toxic pollutants (carbonyls, metals or volatile organic compounds). For each individual monitored site, the data collected were examined to see if any results were above air quality standards or health benchmarks and were then compared with other data collected in the same time period at other monitors in Minnesota.

6.1 Fine particles ($PM_{2.5}$)

Fine particulate matter ($PM_{2.5}$) is a mixture of very small particles and liquid droplets that are created during combustion when coal, gasoline and other fuels are burned. They are also created in the air by chemical reactions between other pollutants. Because of their small size, fine particles can become inhaled into the lungs, possibly lodged in the lungs and can contribute to respiratory and cardiovascular health problems.

Regulatory standards exist for $PM_{2.5}$ measurements, but these standards require a monitoring period of three years or greater. Each monitoring period for this project was too short to consider whether the community monitor results meet fine particle standards. However, as an informal comparison only, the average daily $PM_{2.5}$ values were compared to the daily regulatory $PM_{2.5}$ standard of 35 mg/m^3.

Average daily fine particle measurements were compared to measurements from fixed monitoring sites in the Twin Cities and from other monitoring sites around greater Minnesota.

6.2 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 toxic measurements from the community monitor were compared to measurements from fixed monitoring sites in the Twin Cities and from other monitoring sites around greater Minnesota.

An overview of notable results is reported earlier in this report. More detailed information about the results, the community sites, the monitored pollutants, standards and health benchmarks are found in the appendices.

7. Next steps

7.1 Annual community monitoring

With renewed funding in 2015, MPCA staff made the decision to conduct continued community monitor for the period of at least one year. With that decision, the community air monitor was placed in the St. Anthony Park community in St. Paul, to monitor from the first week of January to the end of December 2015. At the end of the monitoring period, the community monitor will be moved to a new location.

7.2 Polycyclic Aromatic Hydrocarbon (PAH) Community Monitoring

In addition to air monitoring using a fixed platform, funding will be used to monitor for PAHs. These are classes of airborne compounds produced by incomplete combustion, high pressure or high temperature conditions. Exposures to elevated PAHs are linked with respiratory effects.

7.3 AirBeam air monitoring community education

Over the summer of 2016, MPCA staff are providing St. Anthony Park citizen volunteers with a low-cost hand-held air monitoring sensor called an AirBeam that the citizens can use to monitor air in their personal environment. The AirBeam sensors measure temperature, relative humidity, sound levels and levels of fine particulate matter. The goals of the project are to provide MPCA staff with an opportunity to learn about and interact with citizens about low-cost hand-held monitoring sensors, to learn how citizens might use low-cost environmental sensors in their communities and to educate citizens about air quality in their environment.

For more information on the community air monitoring project, please visit https://www.pca.state.mn.us/air/community-air-monitoring-project or call either 651-296-6300 or 1-800-657-3864 and ask for air data analysis staff.

More information about the MPCA's air monitoring program is available on the web at https://www.pca.state.mn.us/air/air-pollution-monitoring.

Appendix A: Community air monitoring project - Monitored air quality pollutants

Carbonyls
Acetaldehyde
Benzaldehyde
Butyraldehyde
Formaldehyde
Propionaldehyde
Trans-Crotonaldehyde

Metals
Antimony
Arsenic
Barium
Beryllium
Cadmium
Chromium
Cobalt
Iron
Lead
Manganese
Nickel
Selenium
Zinc

$PM_{2.5}$ Continuous
$PM_{2.5}$ Concentration

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

Appendix B: Inhalation health benchmark values

Pollutant*	Inhalation Health Benchmark+
1,3-Butadiene	0.17
Acetaldehyde	4.5
Antimony (Tsp) Stp	0.2
Arsenic (Tsp) Stp	0.00233
Benzaldehyde	20
Benzene	1.3
Bromomethane	5
Butyraldehyde	70
Cadmium (Tsp) Stp	0.01
Carbon Disulfide	700
Carbon Tetrachloride	1.7
Chlorobenzene	1000
Chloroethane	10000
Chloroform	0.43
Chloromethane	90
Chromium (Tsp) Stp	0.008
Cobalt (Tsp) Stp	0.001
Cyclohexane	6000
Dichlorobenzene(p), 1,4-	0.91
Dichloromethane	21
Ethylbenzene	4
Formaldehyde	2
Furan, Tetrahydro-	2000
Lead	0.15
M/P Xylene	100
Manganese (Tsp) Stp	0.2
Methyl Ethyl Ketone	5000
N-Hexane	2000
Nickel (Tsp) Stp	0.014
O-Xylene	100
Propionaldehyde	8
Propylene	3000
Selenium (Tsp) Stp	20
Styrene	1000
Tetrachloroethylene	20
Toluene	400
Trichloroethylene	3
Vinyl Acetate	200

*Only pollutants with an IHB are listed.

+For this project, most stringent health standard used and reported.

Appendix C: Summary site reports

Summary

Community Air Monitoring Project
Little Earth residential complex

What we monitored

We monitored air quality for fine particles ($PM_{2.5}$) and air toxics (carbonyls, metals and volatile organic compounds) quality in the Minneapolis East Phillips neighborhood.

Why is it important?

People exposed to air pollution are at increased risk for adverse health effects. This can include shortness of breath, asthma, heart attacks or stroke. Studies show that low-income communities might be unfairly affected by pollution from industrial, highway or air traffic sources.

Monitoring in these communities can help us to better understand the community's air quality and how it compares to other monitoring sites.

Highlights & key findings

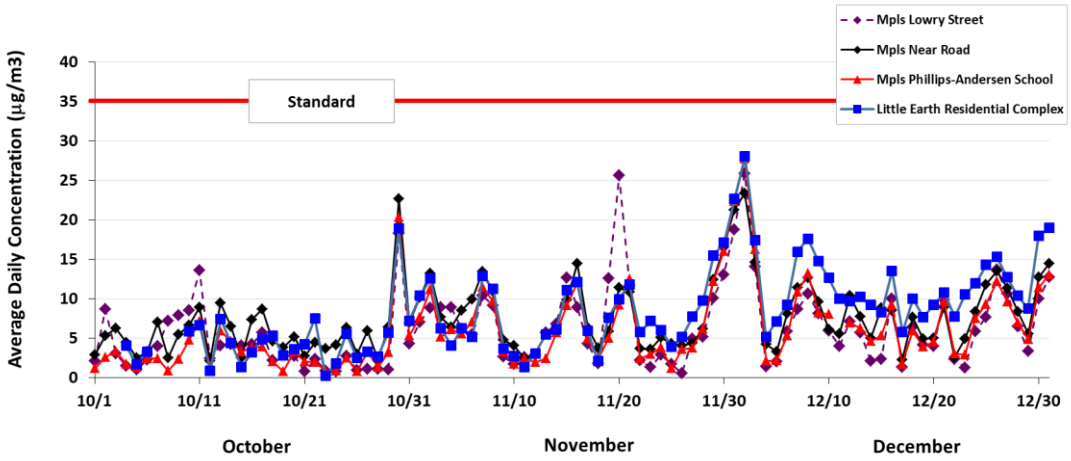
- We put an air monitoring station in the Little Earth residential complex.
- This station monitored air quality for three months from October 1, 2013 to December 31, 2013.
- We compared the monitored data with federal and state air quality standards and health benchmarks. We also compared the data with other air data collected during the same time period at other monitors.
- 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 Little Earth monitor were generally higher than the values seen at most other sites for a majority of the monitoring days.
- Of the 74 air toxic chemicals measured for this project, the levels of 38 chemicals were so low that they were not detected by the monitor.
- Of those chemicals detected, average values were at or below established health benchmark values.

About this study

In 2013, the Minnesota Legislature provided funding for a two-year air monitoring study to measure air quality in Minnesota communities where low income communities might be disproportionately impacted by pollution from highway traffic, air traffic, and industrial sources.

Fine particles ($PM_{2.5}$)

This graph shows the average daily $PM_{2.5}$ levels for the monitor at the Little Earth Residential complex and other Minneapolis monitoring sites. In general, the average daily values and daily trends of $PM_{2.5}$ are similar to levels measured at other Minneapolis sites. All average daily $PM_{2.5}$ values were below the daily standard of 35 $\mu g/m^3$ for all days.

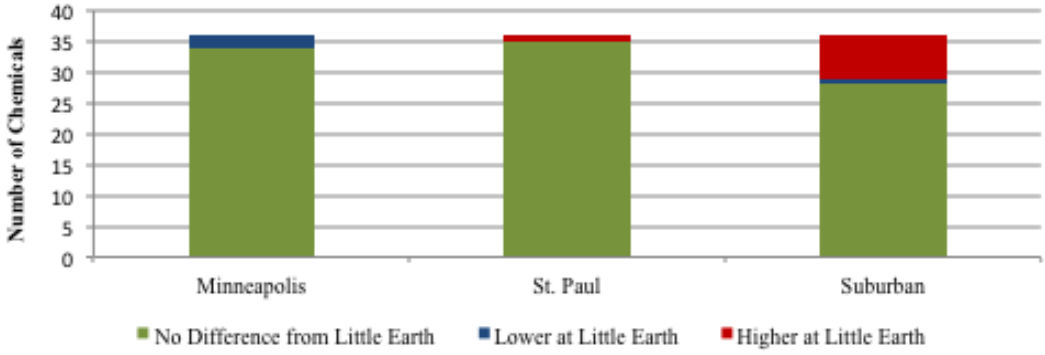


Air toxics

Of the 74 air toxics measured, 36 were detected at the Little Earth monitor. All measured values were at or below the established health benchmark values.

The majority of air toxics measured at Little Earth were not different from levels measured at other Twin Cities monitoring sites.

This graph shows the number of air toxics that differed between the Little Earth monitor and other Twin Cities monitors. Several air toxics measured at Little Earth were higher than levels measured in suburban locations, but were similar to levels measured at other monitoring sites in Minneapolis and St. Paul.



Project website

For more information and to view updates about the Community Air Monitoring Project, please visit www.pca.state.mn.us/9xc4ahc.

Contact

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Summary

Community Air Monitoring Project Thomas-Dale Neighborhood, St. Paul

What we monitored

We monitored air quality for fine particles ($PM_{2.5}$) and air toxics (carbonyls, metals and volatile organic compounds) in the St. Paul Thomas-Dale neighborhood.

Why is it important?

People exposed to air pollution are at increased risk for adverse health effects. This can include shortness of breath, asthma, heart attacks or stroke. Studies show that low-income communities might be unfairly affected by pollution from industrial, highway or air traffic sources.

Monitoring in these communities can help us to better understand the community's air quality and how it compares to other monitoring sites.

Highlights and key findings

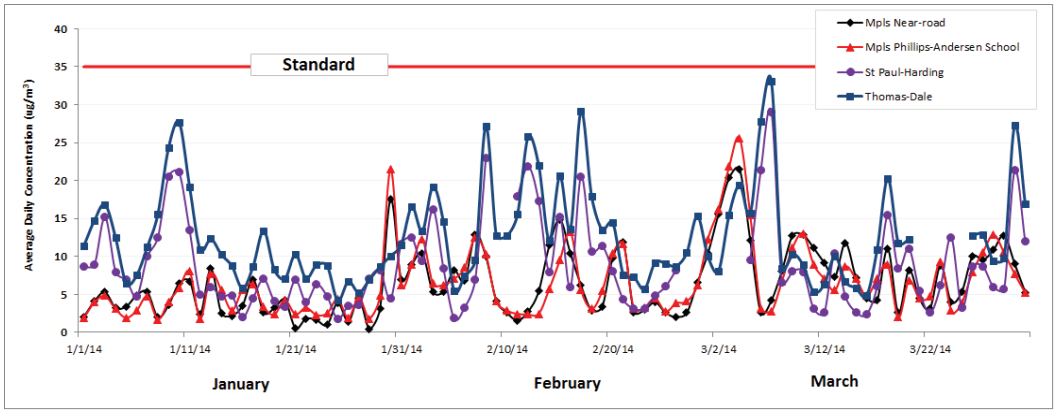
About this study

In 2013, the Minnesota Legislature provided funding for a two-year air monitoring study to measure air quality in Minnesota communities where low income communities might be disproportionately impacted by pollution from highway traffic, air traffic, and industrial sources.

- We put an air monitoring station in the St. Paul Thomas-Dale neighborhood. This station monitored air quality for three months from January 1, 2014 to March 31, 2014.
- We compared the monitored data with air quality health standards and compared the data with other air data collected during the same time period at other monitors.
- 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. We continue to examine metro area $PM_{2.5}$ values to better understand values and trends.
- Of the 74 air toxic chemicals measured for this project, the levels of 42 chemicals were so low that they were not detected by the monitor. In general, average air toxics values and trends over time were similiar between the Thomas-Dale monitor and other MPCA air monitors.
- 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.

Fine particles ($PM_{2.5}$)

This graph shows the average daily $PM_{2.5}$ values at the Thomas-Dale and other metro air monitors. The average daily trends were similar across the monitors. While all average daily $PM_{2.5}$ values were below the daily $PM_{2.5}$ standard of 35 µg/m³, 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.

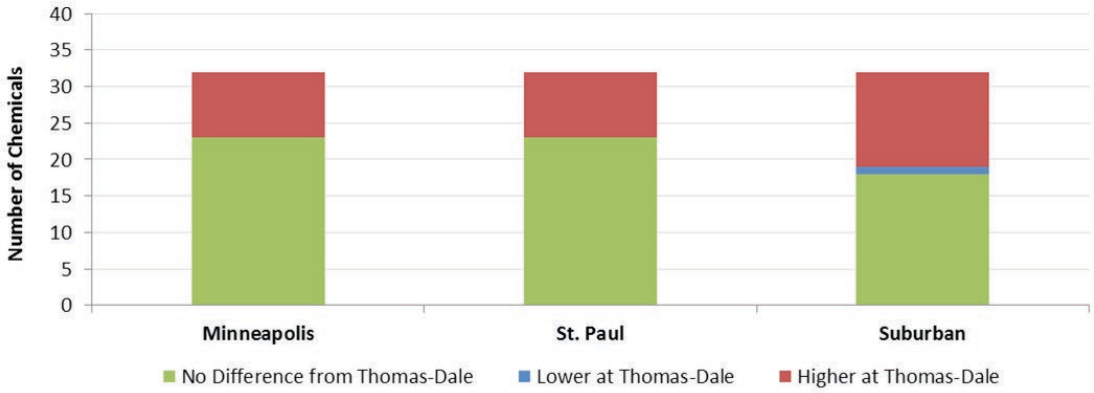


Air toxics

Of the 74 air toxics measured, 32 were detected at the Thomas-Dale monitor.

The majority of air toxics measured at Thomas-Dale were not different from levels measured at other Twin Cities monitoring sites. With the exception of formaldehyde, all other measured values were at or below the established health benchmark values. The three-month formaldehyde average for this monitor (2.5 µg/m³) and for most other metro air monitors were above the long-term health benchmark (2 µg/m³). The MPCA is working to better understand the sources of formaldehyde in Twin Cities air.

This graph shows the number of air toxics that differed between the Thomas-Dale monitor and other Twin Cities monitors.



Project website

For more information on the Community Air Monitoring Project, please visit www.pca.state.mn.us/9xc4ahc or call either 651-296-6300 or 1-800-657-3864 and ask for Air Data Analysis staff.

More information about the MPCA's Air Monitoring Program is available on the web at http://www.pca.state.mn.us/ruu6fhw.

Summary

Community Air Monitoring Project
St. Paul – West Side

What we monitored

We monitored air quality for fine particles ($PM_{2.5}$) and air toxics (carbonyls, metals and volatile organic compounds-VOCs) in the St. Paul West Side neighborhood.

Why is it important?

People exposed to air pollution are at increased risk for adverse health effects. This can include shortness of breath, asthma, heart attacks or stroke. Studies show that low-income communities might be unfairly affected by pollution from industrial, highway or air traffic sources.

Monitoring in these communities can help us to better understand the community's air quality and how it compares to other monitoring sites.

Highlights & key findings

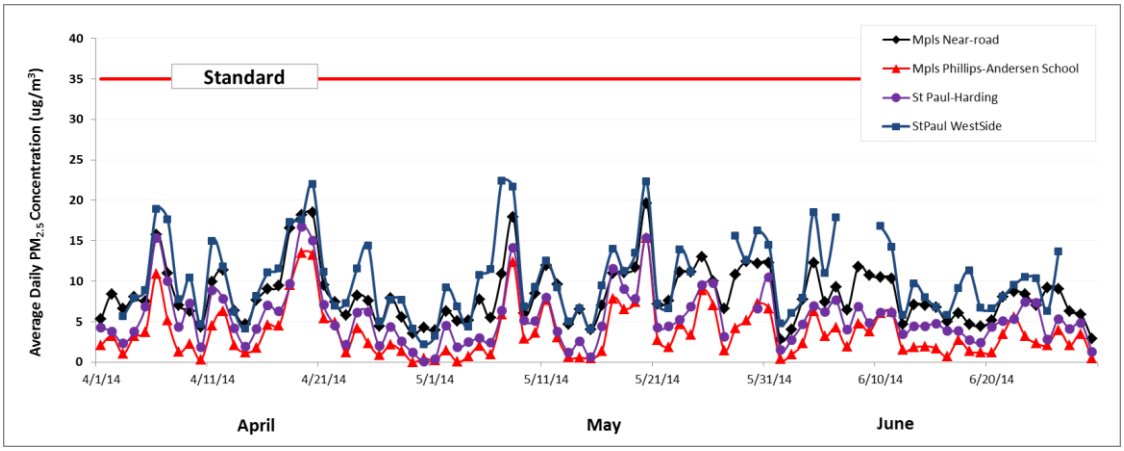
- We put an air monitoring station in the St. Paul West Side neighborhood. This station monitored air quality for three months from April 1, 2014 to June 30, 2014.
- Although only a three-month study, for comparison purposes, we compared the monitored data with annual air quality health standards. We also compared the data with other air data collected during the same time period at other monitors.
- 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 St. Paul West Side monitor were generally higher than values seen at most other sites for a majority of the monitoring days but followed a similar daily trend as other metro sites.
- Of the 74 air toxic chemicals measured for this project, the levels of 46 chemicals were so low that they were not detected by the monitor.
- All average VOC and carbonyl values were below health benchmarks except for formaldehyde. The average values of formaldehyde at most monitoring sites in the Twin Cities metro were slightly above health benchmarks. Higher formaldehyde values are expected in warmer months and are lower in winter months.
- Of the detected metals, the three-month average metal values were higher at this site than the other Twin Cities metro sites, but all were below annual health benchmarks except for arsenic. The MPCA is working to better understand these results.

About this study

In 2013, the Minnesota Legislature provided funding for a two-year air monitoring study to measure air quality in Minnesota communities where low income communities might be disproportionately impacted by pollution from highway traffic, air traffic, and industrial sources.

Fine particles ($PM_{2.5}$)

This graph shows the average daily $PM_{2.5}$ values at the St. Paul West Side and other metro air monitors. The average daily trends were similar across the monitors. While all average daily $PM_{2.5}$ values were below the daily $PM_{2.5}$ standard of 35 µg/m^3, average daily values measured at the St. Paul West Side monitor were generally higher than those seen at most other sites for a majority of the monitoring days.

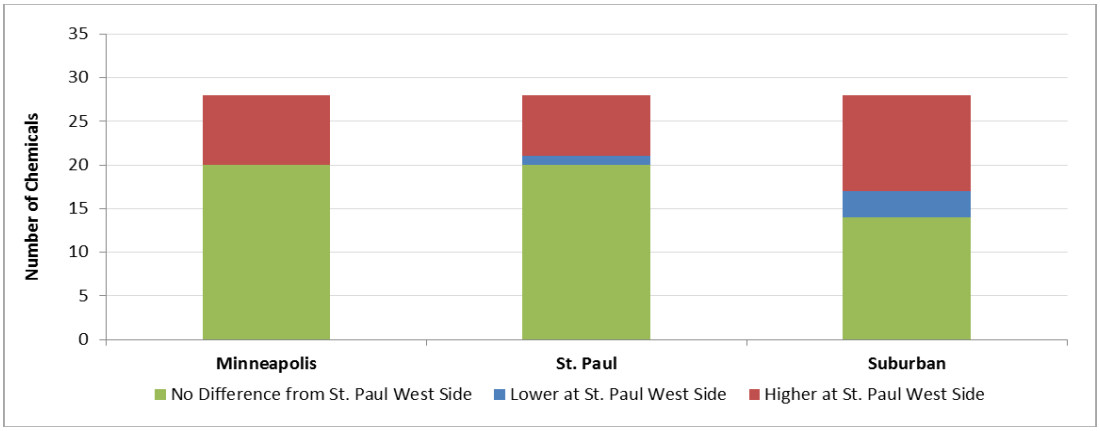


Air toxics

Of the 74 air toxics measured, 28 were detected at the St. Paul West Side monitor.

The majority of air toxics measured were not significantly* different from levels measured at other Twin Cities monitoring sites. With the exception of formaldehyde and arsenic, all other average parameter values were at or below the established health benchmark values. The three-month formaldehyde average* for this monitor (3.5 µg/m^3) and for most other metro air monitors were above the long-term health benchmark (2 µg/m^3). The three-month arsenic average* (0.0046 µg/m^3) was above the long-term health benchmark (0.0023 µg/m^3).

This graph shows the number of air toxics that differed between the St. Paul West Side monitor and other Twin Cities monitors.



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

Project website

For more information on the community air monitoring project, please visit www.pca.state.mn.us/9xc4ahc or call either 651-296-6300 or 1-800-657-3864 and ask for air data analysis staff.

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

Summary

Community Air Monitoring Project
Phillips Neighborhood
Greenway Trail-28th Avenue Intersection

What we monitored

We monitored air quality for fine particles ($PM_{2.5}$) and air toxics (carbonyls, metals and volatile organic compounds-VOCs) at the Minneapolis Greenway Trail - 28th Avenue intersection.

Why is it important?

People exposed to air pollution are at increased risk for adverse health effects. This can include shortness of breath, asthma, heart attacks or stroke. Studies show that low-income communities might be unfairly affected by pollution from industrial, highway or air traffic sources. Monitoring in these communities can help us to better understand the community's air quality and how it compares to other monitoring sites.

Highlights & key findings

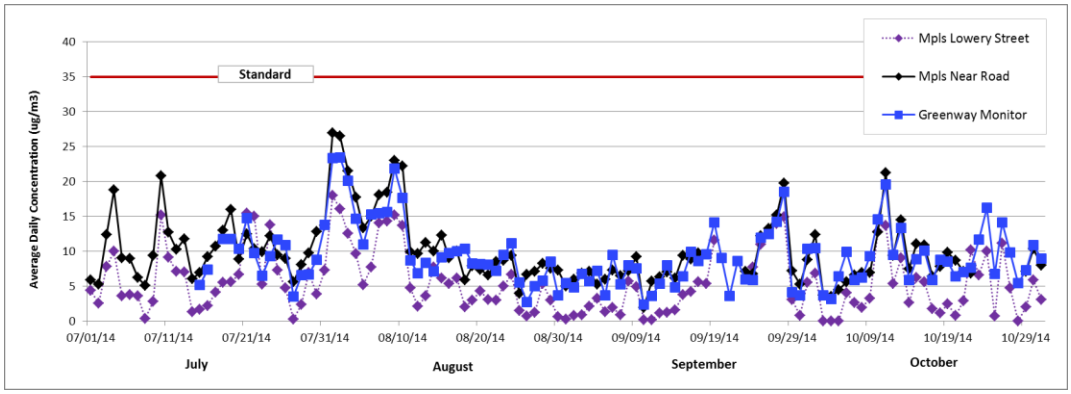
- A monitoring station was located in the Phillips Community at the Minneapolis Greenway Trail - 28th Avenue intersection.
- This station monitored air quality for over three months from July 15, 2014 to October 31, 2014.
- We compared the monitored data with air quality health standards and compared the data with other air data collected during the same time period at other monitors.
- 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 Greenway monitor followed a similar daily trend as other Minneapolis sites.
- Of the 72 air toxic chemicals currently analyzed for this project, the levels of 42 chemicals were either not detected by the monitor or had too few detects to be analyzed.
- All average air toxic chemical values were below health benchmarks except formaldehyde. The average daily values of formaldehyde at all metro sites were slightly above health benchmarks.

About this study

In 2013, the Minnesota Legislature provided funding for a two-year air monitoring study to measure air quality in Minnesota communities where low income communities might be disproportionately impacted by pollution from highway traffic, air traffic, and industrial sources.

Fine particles ($PM_{2.5}$)

This graph shows the average daily $PM_{2.5}$ values at the Greenway community monitor and other Minneapolis air monitors. The average daily $PM_{2.5}$ trends were similar across these monitors.

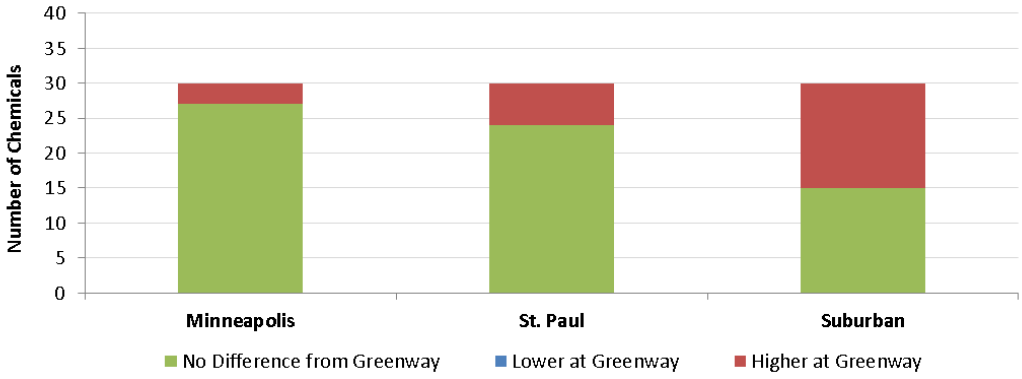


Air toxics

Of the 72 air toxics measured, 30 were detected at the Greenway monitor.

The majority of air toxics measured were not significantly* different from levels measured at other Twin Cities monitoring sites. With the exception of formaldehyde, all reported air toxics chemicals were at or below established health benchmark values. The three-month average formaldehyde concentration at this monitor (3 $\mu g/m^3$) and for most other metro air monitors were above the long-term health benchmark (2 $\mu g/m^3$). The MPCA is working to better understand the sources of formaldehyde in Twin Cities' air.

The graph below shows the number of air toxics that differed between the Greenway monitor and other Twin Cities monitors.



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

Project website

For more information on the community air monitoring project, please visit www.pca.state.mn.us/9xc4ahc or call either 651-296-6300 or 1-800-657-3864 and ask for air data analysis staff.

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

Summary

Community Air Monitoring Project
Minneapolis – Harrison Neighborhood

What we monitored

We monitored air quality for fine particles ($PM_{2.5}$) and air toxics (carbonyls, metals and volatile organic compounds) in the Minneapolis Harrison neighborhood.

Why is it important?

People exposed to air pollution are at increased risk for adverse health effects. This can include shortness of breath, asthma, heart attacks or stroke. Studies show that low-income communities might be unfairly affected by pollution from industrial, highway or air traffic sources.

Monitoring in these communities can help us to better understand the community's air quality and how it compares to other monitoring sites.

Highlights & key findings

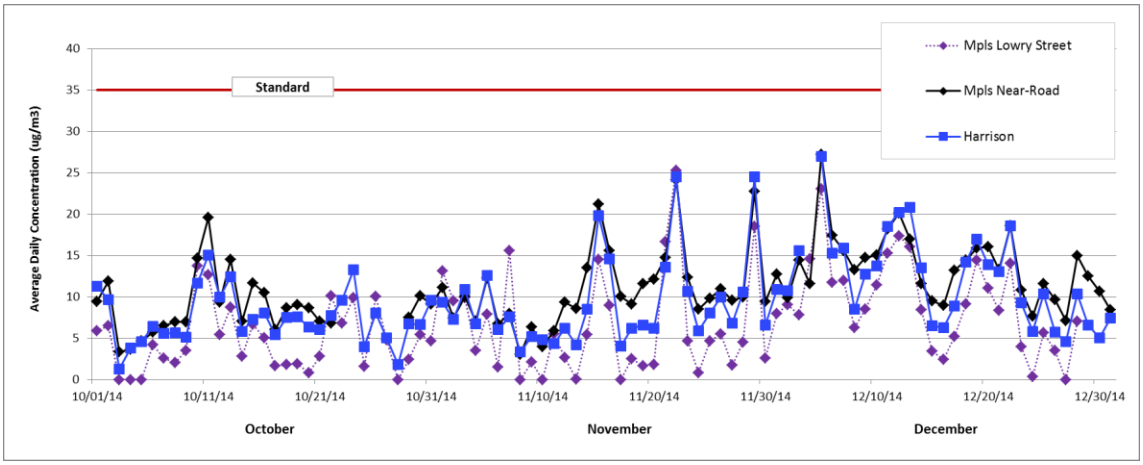
- We put an air monitoring station in the Minneapolis Harrison neighborhood.
- This station monitored air quality for three months from October 1, 2014 to December 31, 2014.
- We compared the monitored data with air quality health standards and compared the data with other air data collected during the same time period at other monitors.
- 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 Harrison monitor followed a similar daily trend as other Minneapolis sites.
- Of the 72 measured air toxic chemicals, the levels of 41 chemicals were so low that they were not detected by the monitor.
- Of those chemicals detected, average values were at or below established health benchmark values.

About this study

In 2013, the Minnesota Legislature provided funding for a two-year air monitoring study to measure air quality in Minnesota communities where low income communities might be disproportionately impacted by pollution from highway traffic, air traffic, and industrial sources.

Fine particles ($PM_{2.5}$)

This graph shows the average daily $PM_{2.5}$ values at the Harrison community monitor and other Minneapolis air monitors. The average daily $PM_{2.5}$ behavior was similar across these monitors.

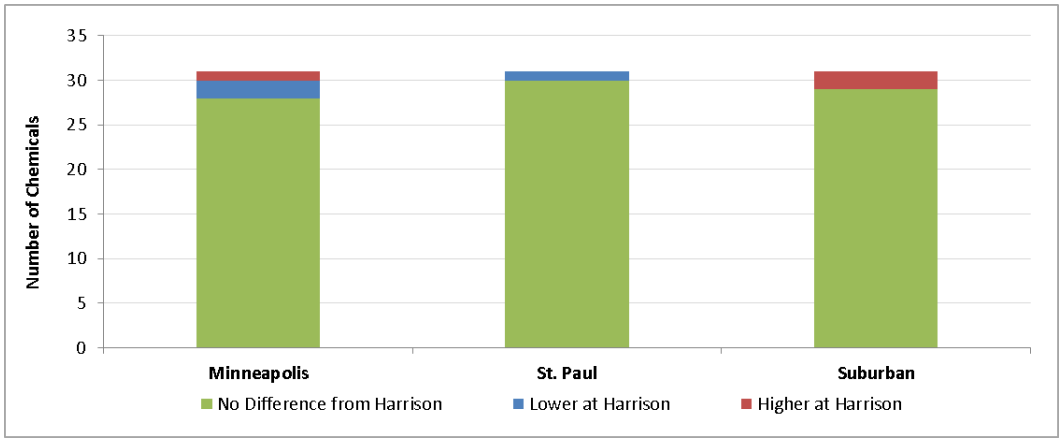


Air toxics

Of the 72 air toxics measured, 31 were detected at the Harrison community monitor.

The majority of air toxics measured were not different from levels measured at other Twin Cities monitoring sites.

This graph shows the number of air toxics that differed between the Harrison monitor and other Twin Cities monitors. For all detected chemicals, average values were at or below established health benchmark values.



Project website

For more information on the community air monitoring project, please visit www.pca.state.mn.us/9xc4ahc or call either 651-296-6300 or 1-800-657-3864 and ask for air data analysis staff.

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

Summary

Community Air Monitoring Project Minneapolis-Lyndale Neighborhood

What we monitored

We monitored air quality for fine particles ($PM_{2.5}$) and air toxics (carbonyls, metals and volatile organic compounds) in the Minneapolis Lyndale Neighborhood.

Why is it important?

People exposed to air pollution are at increased risk for adverse health effects. This can include shortness of breath, asthma attacks, heart attacks or stroke. Studies show that low-income communities might be unfairly affected by pollution from industrial, highway or air traffic sources.

Monitoring in these communities can help us to better understand the community's air quality and how it compares to other monitoring sites.

Highlights and key findings

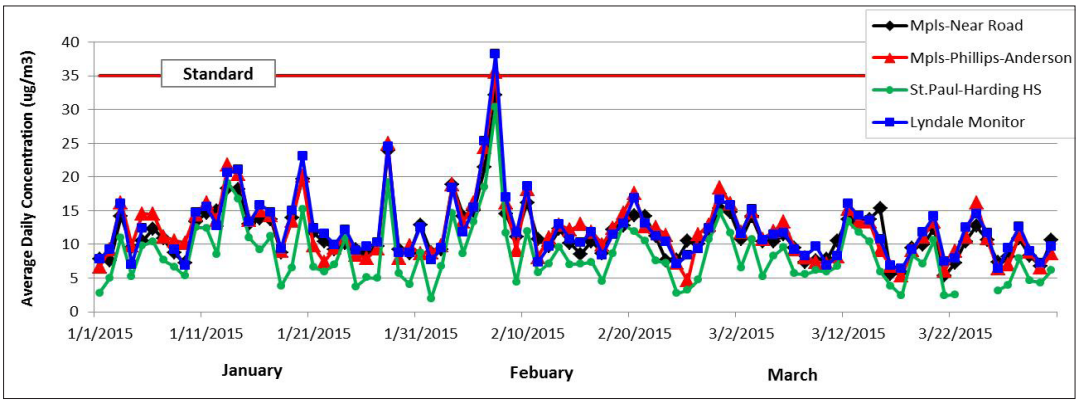
- We put an air monitoring station in the Minneapolis-Lyndale neighborhood and monitored air quality for three months from January 1, 2015 to March 31, 2015.
- For comparison purposes, we compared the monitored data with annual air quality health standards. We also compared the data with other air data collected during the same time period at other monitors.
- All average daily $PM_{2.5}$ values except one were below the daily $PM_{2.5}$ standard of 35 micrograms per cubic meter ($\mu g/m^3$). On February 7, 2015, the average daily $PM_{2.5}$ value was 38 $\mu g/m^3$ at the Lyndale monitor. On this day, the average daily $PM_{2.5}$ value was high at all Twin Cities' monitors due to a local winter time stagnation event.
- Of the 70 air toxic chemicals measured for this project, the levels of 39 chemicals were so low that they were not detected by this monitor.
- Of those chemicals detected, average values were at or below any associated health benchmark values.

About this study

In 2013, the Minnesota Legislature provided funding for a two-year air monitoring study to measure air quality in Minnesota communities where low income communities might be disproportionately impacted by pollution from highway traffic, air traffic, and industrial sources.

Fine particles ($PM_{2.5}$)

This graph shows the average daily $PM_{2.5}$ values at the Lyndale monitor and other Twin cities air monitors. The daily trends were similar across the monitors. Average daily $PM_{2.5}$ values at the Lyndale monitor were below the daily standard of 35 µg/m^3, for all days except one-February 7, 2015, with a value of 38 µg/m^3. On this day, the average daily $PM_{2.5}$ value was high at all Twin Cities' monitors due to a local winter time stagnation event.

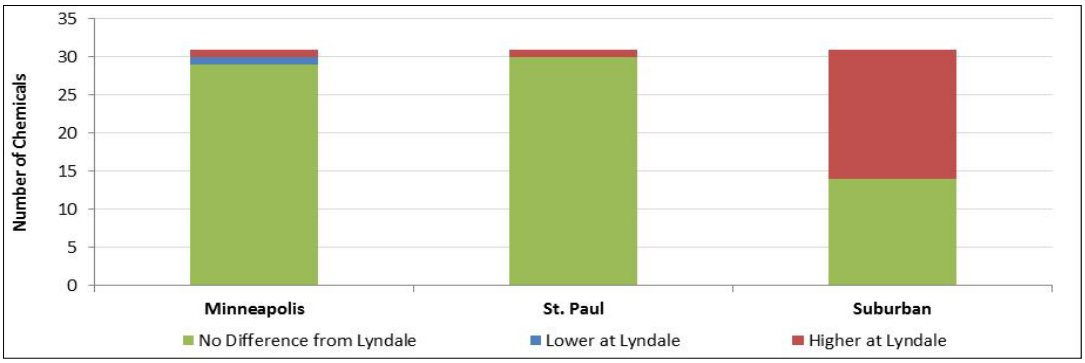


Air toxics

Of the 70 air toxics measured, 31 were detected at the Lyndale monitor.

The majority of air toxics measured at Lyndale monitor were not significantly* different from levels measured at other Twin cities monitoring sites. All air toxics measured at the Lyndale monitor were below established standards and health benchmark values.

This graph shows the number of detected air toxics that differed* between the Lyndale monitor and other Twin Cities monitors. Air toxics were similar to levels measured at most other monitors.



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

Project website

For more information on the Community Air Monitoring Project, please visit www.pca.state.mn.us/air/community-air-monitoring project or call either 651-296-6300 or 1-800-657-3864 and ask for air data analysis staff.

More information about the MPCA's Air Monitoring Program is available on the Web at http://www.pca.state.mn.us/air/air-pollution-monitoring.

Summary

Community Air Monitoring Project St. Paul Payne-Phalen

What we monitored

We monitored air quality for fine particles ($PM_{2.5}$) and air toxics (carbonyls, metals and volatile organic compounds) in the St. Paul Payne-Phalen community.

Why is it important?

People exposed to air pollution are at increased risk for adverse health effects. This can include shortness of breath, asthma attacks, heart attacks or stroke. Studies show that low-income communities might be unfairly affected by pollution from industrial, highway or air traffic sources.

Monitoring in these communities can help us to better understand the community's air quality and how it compares to other monitoring sites.

Highlights and key findings

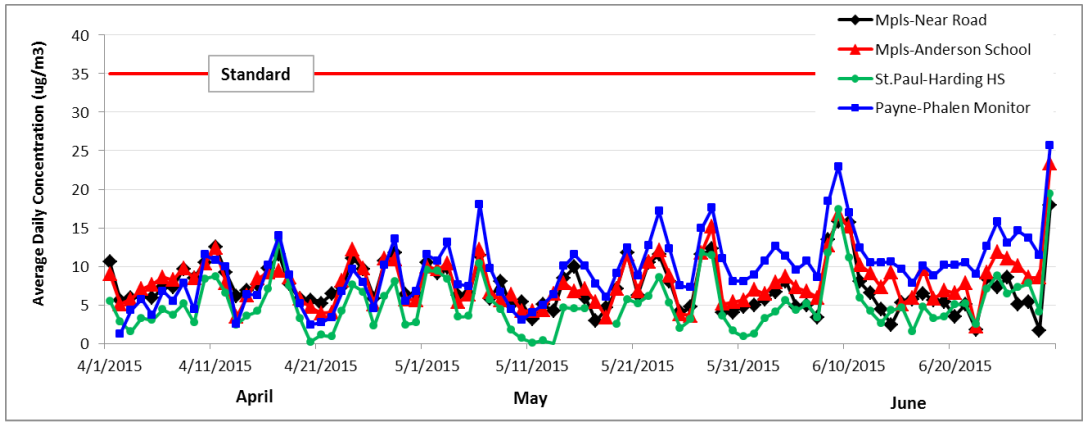
About this study

In 2013, the Minnesota Legislature provided funding for a two-year air monitoring study to measure air quality in Minnesota communities where low income communities might be disproportionately impacted by pollution from highway traffic, air traffic, and industrial sources.

- We put an air monitoring station in the St. Paul Payne-Phalen community. This station monitored air quality for over three months from April 1, 2015 to June 30, 2015.
- We compared the monitored data with air quality health standards and compared the data with other air data collected during the same time period at other monitors.
- 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 Payne-Phalen monitor were generally higher than the values seen at most other sites for a majority of the monitoring days.
- Of the 70 air toxic chemicals measured for this project, the levels of 44 chemicals were so low that they were not detected by the monitor.
- Average air toxic values measured at the Payne-Phalen site were all below any associated health benchmark values.

Fine particles ($PM_{2.5}$)

This graph shows the average daily $PM_{2.5}$ values at the Payne-Phalen community monitor and other metro air monitors. The average daily $PM_{2.5}$ behavior was similar across the monitors.All average daily $PM_{2.5}$ value were below the daily $PM_{2.5}$ standard of 35 µg/m^3 .

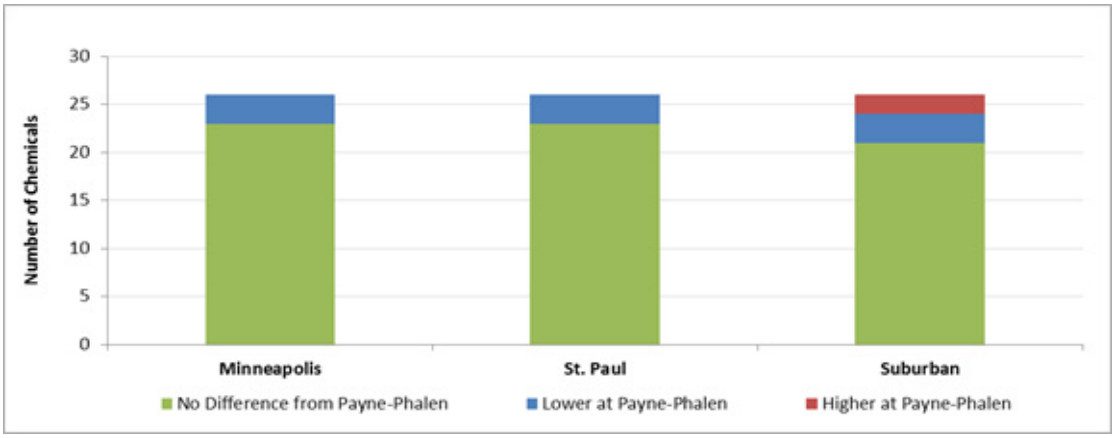


Air toxics

Of the 70 air toxics measured, 26 were detected at the Payne-Phalen community monitor.

The majority of air toxics measured at the Payne-Phalen monitor were not significantly* different from levels measured at other Twin Cities monitoring sites. All air toxics measured at the Payne-Phalen monitor were below established health benchmark values.

This graph shows the number of detected air toxics that differed* between the Payne-Phalen monitor and other Twin Cities monitors. Air toxics were similar to levels measured at other air monitors.



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

Project website

For more information on the Community Air Monitoring Project, please visit www.pca.state.mn.us/air/community-air-monitoring project or call either 651-296-6300 or 1-800-657-3864 and ask for air data analysis staff.

More information about the MPCA's Air Monitoring Program is available on the Web at http://www.pca.state.mn.us/air/air-pollution-monitoring.

Summary

Community Air Monitoring Project Duluth - Denfeld and Lincoln Park

What we monitored

We monitored air quality for fine particles ($PM_{2.5}$) and air toxics (carbonyls, metals and VOCs) in the Denfeld and Lincoln Park communites in Duluth.

Why is it important?

People exposed to air pollution are at increased risk for adverse health effects. This can include shortness of breath, asthma attacks, heart attacks or stroke. Studies show that low-income communities might be unfairly affected by pollution from industrial, highway or air traffic sources.

Monitoring in these communities can help us to better understand the community's air quality and how it compares to other monitoring sites.

Highlights and key findings

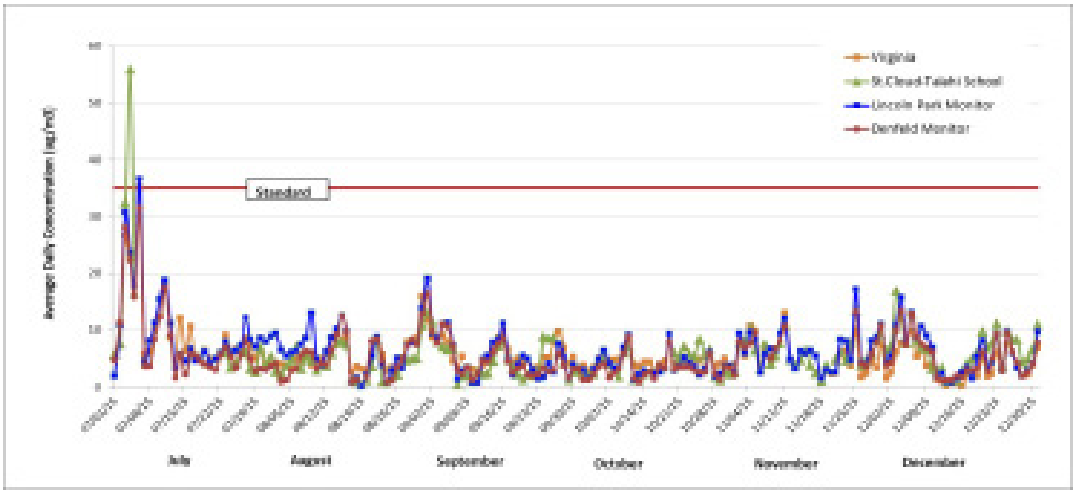
About this study

In 2013, the Minnesota Legislature provided funding for a two-year air monitoring study to measure air quality in Minnesota communities where low income communities might be disproportionately impacted by pollution from highway traffic, air traffic, and industrial sources.

- Using and supplementing two existing Duluth air monitoring sites, air quality was monitored from July 1, 2015 to December 31, 2015, in the Duluth communites of:
  - Lincoln Park (MPCA site 7549 Michigan Street) and
  - Denfeld (MPCA site 7554 Laura MacArthur School)
- We compared the monitored data with air quality health standards and compared the data with other air data collected during the same time period at other monitors.
- All average daily $PM_{2.5}$ values were below the daily $PM_{2.5}$ standard of 35 micrograms per cubic meter ($\mu g/m^3$) except for one day July 6, 2015, at the Lincoln Park monitoring site, the average daily $PM_{2.5}$ value was 37 $\mu g/m^3$. During this week, heavy smoke from fires in Canada contributed to elevated $PM_{2.5}$ values at many monitors.
- For the Lincoln Park community monitor, of the 70 air toxic chemicals measured for this project, the levels of 28 chemicals were so low that they were not detected by the monitor.
- For the Denfeld communit monitor, of the 70 air toxic chemcials measured for this project, the levels of 34 chemicals were so low that they were not detected by the monitor.
- In general, average air toxics values and trends over time were similar or lower between the Denfeld monitor, the Lincoln Park monitor, and other MPCA air monitors. All air toix values in both communities were below any associated standards or health benchmarks.

Fine particles ($PM_{2.5}$)

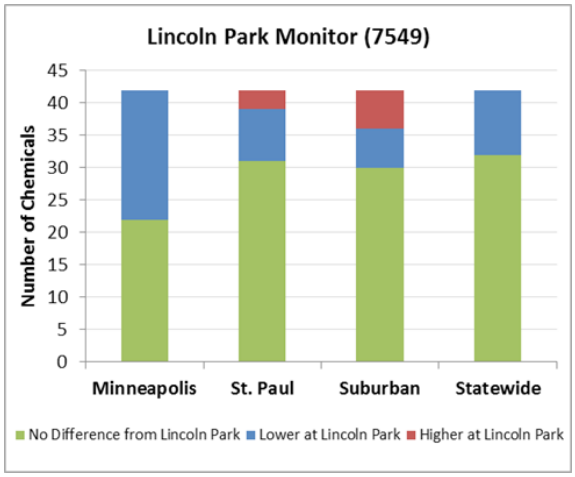
This graph shows the average daily $PM_{2.5}$ values at each Duluth monitor and monitors located in Virginia and St. Cloud. The average daily $PM_{2.5}$ behavior was similar across the monitors. All average $PM_{2.5}$ values were below the daily $PM_{2.5}$ standard of 35 µg/m^3 except for one day. On July 6, 2015, at the Lincoln Park monitoring site, the average daily $PM_{2.5}$ value was 37 µg/m^3. During this week, heavy smoke from fires in Canada contributed to elevated $PM_{2.}$ values at many air quality monitors.

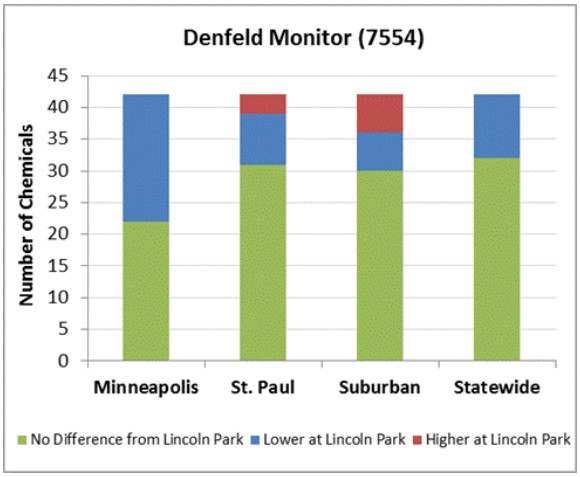


Air toxics

Of the 70 air toxics measured, 42 were detected at the Lincoln Park monitor and 36 were measured at the Denfeld monitor. The majority of air toixcs were not different between the two sites. The majority of air toixcs measured at both sites were not significantly* different from levels measured at other monitoring sites.

All air toxic values in both communities were below any associated standard or health benchmark.





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

Project website

For more information on the Community Air Monitoring Project, please visit www.pca.state.mn.us/air/community-air-monitoring project or call either 651-296-6300 or 1-800-657-3864 and ask for air data analysis staff.

More information about the MPCA's Air Monitoring Program is available on the Web at http://www.pca.state.mn.us/air/air-pollution-monitoring.