

Date: October 27, 2017

To: Alder Marsha Rummel – City of Madison

From: Steven Klafka, P.E., BCEE

Subject: Air Quality Evaluation for Proposed Apartment Projects Adjacent to Madison-Kipp

INTRODUCTION

Air quality around the Madison-Kipp (Kipp) factories is once again a topic of conversation due to proposed apartment projects adjacent to the factory on Fair Oaks Avenue. As an environmental engineer specializing in air pollution control for over 30 years, I don't think there is sufficient understanding of the air quality problems surrounding Kipp. The information we have so far - prior air quality monitoring at Lowell School and air quality dispersion modeling by the Department of Natural Resources (DNR) and by myself - shows Kipp is violating the air quality standards for fine particles (PM2.5) throughout the surrounding neighborhood, including the sites of the two proposed apartment complexes on Fair Oaks Avenue. Neither Kipp, Public Health – Madison and Dane County (PHMDC), the DNR, nor project developers have provided any information to prove that Kipp air pollution emissions do not pose a hazard to the health of the residents of the new apartment complexes or to existing neighborhood residents.

I recommend that:

1. Neither of the apartment projects, the Stone House low-income development at 134 South Fair Oaks Avenue or the Inventure Capital development at 131 South Fair Oaks Avenue, should proceed until we better understand the composition of Kipp's emissions and conduct air quality monitoring to confirm that Kipp complies with air quality standards.
2. Taking advantage of recent availability of low-cost ambient air quality monitoring equipment, either the city or apartment developers should install monitoring stations to measure PM2.5 concentrations in the neighborhood around Kipp to verify it complies with air quality standards.

To support my recommendations, I: 1) reviewed the September 12, 2017 air pollution dispersion analysis prepared by SCS Engineers for developers of the apartments at 131 South Fair Oaks; 2) reviewed the December 8, 2016 PHMDC memorandum supporting construction of the low-income apartments at 134 South Fair Oaks; 3) reviewed the PM2.5 measurements collected by the ambient monitoring on the roof of Lowell Elementary School during the 2005-06 period; and, 4) updated the dispersion modeling analysis conducted by the DNR to support the air pollution permit it last issued to Kipp.

REVIEW OF SCS AIR QUALITY MODELING STUDY FOR INVENTURE CAPITAL

The September 12, 2017 report, "Air Quality Modeling Study for the Fair Oaks Mixed-Use Redevelopment Project", was prepared by SCS Engineers of Carlsbad, California for Michael Thorson of Inventure Capital LLC. The purpose of this report was to support construction of the proposed

apartments at 131 South Fair Oaks Avenue across the street from the Kipp aluminum die casting factory. SCS conducted a dispersion modeling analysis using the AERMOD computer model. I am familiar with dispersion modeling analyses since I use the AERMOD model frequently in my environmental engineering work. They also compared Kipp emissions with those from a light-duty vehicle.

Here is a summary of my comments on the SCS analysis and its conclusions:

Notably absent from the SCS report is any conclusion that Kipp emissions pose no health hazard to the residents of the proposed Fair Oaks apartments. I would have assumed that was the purpose for creating this report.

The SCS modeling analysis for the most part followed DNR and Environmental Protection Agency (USEPA) procedures to determine how air pollution emissions are dispersed from the stacks at a factory or power plant. The SCS analysis used five years of Madison weather data provided by the DNR for this purpose from the 2011 to 2015 period. The analysis incorporated the location of the proposed Fair Oaks apartments and the buildings at the Kipp Fair Oaks factory.

It is the normal procedure to evaluate all of the stacks at a factory. However, SCS evaluated only one of the 81-foot stacks at Kipp's Fair Oaks factory. There are actually four stacks at the factory which exhaust emissions from the aluminum melting and die casting operations. Additionally, there are 11 more stacks at Kipp's nearby Atwood factory. SCS used one of the Kipp die casting stacks for their evaluation, rather than the shorter aluminum melting furnace stack which is located closer to the proposed apartments. Using this stack may have underestimated the air pollution impacts of Kipp emissions.

It is the normal procedure to evaluate the approved air pollution emissions released from each stack. However, SCS evaluated a generic emission rate of 1 gram per second from the Fair Oaks stack. SCS then used the emissions included in a recent application to the DNR for a 0.5 ton-per-hour aluminum furnace. SCS did not consider the emissions generated by the existing and larger 4 ton-per-hour furnace and the existing die casting operations at the Fair Oaks Avenue factory, or the existing furnaces and die casting operations at the nearby Atwood Avenue factory.

SCS does not make a conclusion in its modeling study about the safety of the emissions from Kipp. However, Inventure Capital LLC stated, through its attorney Jeff Vercauteren, that: "The study concludes that based on average wind direction, temperature and the proposed height of the new building, the maximum peak 1 hour emissions reaching the project site are equivalent to approximately half the emissions from a light duty vehicle driving down the road at 30 mph." While this statement is not made by SCS within its modeling study, I agree that it is true for Carbon Monoxide (CO) emissions and further is supported by the emission calculations provided to me by Mr. Vercauteren as part of the modeling report.

However, this light-duty vehicle comparison is misleading for the following reasons: 1) while CO emission are half of Kipp emissions from the furnace, Volatile Organic Compound (VOC) and Nitrogen Oxide (NOx) emissions are, respectively, three and five times higher than those of a vehicle; 2) only the proposed small furnace is used to compare air pollution emissions, not the existing and larger 4 ton-per-

hour furnace and the existing die casting operations at the Fair Oaks factory, or the many other operations at the Atwood factory; and 3) the far more important air pollutant of concern is fine particle emissions (PM2.5) released by Kipp, not CO, NOx or VOC which are released by natural gas combustion. Fine particle emissions from light-duty vehicles are negligible and not a valid comparison. If the only source of air pollution at Kipp were natural gas combustion, Kipp would not have a long history of environmental contamination and health complaints.

Below is the comparison made by SCS between the small furnace at Kipp and a light-duty vehicle.

Air Pollutant	Furnace	Furnace	Vehicle	Vehicle	Vehicle	Ratio
	Emission	Emission	Emission	Speed	Emission	Furnace
	(lb/hr)	(grams/hr)	(grams/mile)	(mph)	(grams/hr)	to Vehicle
Carbon Monoxide	0.27	122	8.73	30	262	47%
Nitrogen Oxides	0.09	41	0.56	30	17	243%
VOC	0.08	36	0.79	30	24	153%

It is a normal dispersion modeling procedure to determine downwind pollutant concentrations and compare them with air quality standards. The supporting calculations for the modeling study present this comparison but only considered the emissions from the proposed 0.5 ton-per-hour furnace, not any of the existing Kipp operations. It is typical to incorporate background concentrations but none were included in the SCS analysis. The comparison with air quality standards in the supporting calculations is neither presented in the report nor used to make conclusions about the safety of Kipp emissions.

SCS determined that a 1 gram per second emission rate from the 81-foot stack would cause a maximum 1-hour average concentration of 189.1 microgram per cubic meter (ug/m3) at a height of 10 feet at the proposed apartments, and a maximum 5-year average concentration of 8.6 ug/m3 at a height of 60 feet at the proposed apartments.

As stated by Mr. Vercauteren, CO emissions from the Kipp furnace were compared with a light-duty vehicle. Our current understanding of air pollution from Kipp suggests that fine particles or PM2.5 is the air pollutant which poses the greatest hazard to the surrounding neighborhood and to new residents in the proposed apartment complexes. The metal melting and die casting operations at Kipp are the types of industrial operations that would create and emit PM2.5. CO has not been shown to be a concern.

I used the SCS modeling results and Kipp’s approved particulate matter emissions for its operations at the Atwood and Fair Oaks factories to estimate downwind concentrations. In its current air pollution control permit from the DNR, Kipp is allowed to release 31.76 pounds per hour of particulate matter from both the Fair Oaks and Atwood factories. This is the same as 4.0 grams per second.

The estimated maximum downwind concentrations at the proposed Fair Oaks apartments are as follows:

$$1\text{-hour average} = 4.0 \times 189.1 = 756.4 \text{ ug/m}^3$$

Though this is not the same averaging period, the estimated 756.4 ug/m³ is over 10 times the 24-hour air quality standard of 35 ug/m³.

5-year average = 4.0 x 8.6 = 34.4 ug/m³

The estimated 34.4 ug/m³ is nearly three times the annual average air quality standard of 12 ug/m³.

While not as accurate as modeling all of Kipp's stacks, these estimates derived from the SCS modeling analysis suggest PM_{2.5} concentrations at the proposed Fair Oaks apartments would exceed air quality standards. Clearly, further evaluation is needed.

The above concentrations are a very rough estimate since they are based on a single stack and assume all of Kipp's emissions are released from this stack. The normal procedure for the DNR, USEPA and air pollution control engineers to determine if a factory complies with air quality standards is to conduct a refined modeling analysis. This would evaluate all of the stacks at the factory and to use the currently approved emissions in its pollution permit. If the refined modeling analysis shows that standards will be exceeded, then the factory must reduce its emissions until it can comply with the air quality standards.

UPDATED AIR QUALITY MODELING ANALYSIS FOR FINE PARTICLES (PM_{2.5})

In 2007, the DNR conducted a refined dispersion modeling analysis to determine if Kipp complied with air quality standards and could be issued an air pollution control permit. As a result of that analysis, Kipp closed many of its short roof vents and installed numerous tall stacks to improve dispersion of its particulate matter emissions. At that time, the DNR only required Kipp to comply with the old particulate matter air quality standard of 150 ug/m³. The height of the current stacks was designed to meet this older standard. In 2006, USEPA adopted a new fine particle standard for PM_{2.5} of 35 ug/m³. Based on the DNR modeling analysis from 2007, Kipp does not comply with the current standards. Despite being 10 years old, Kipp's air pollution permit has not been renewed by the DNR, and the DNR has not conducted an updated modeling analysis to verify Kipp complies with current air quality standards.

More recently the Walker administration has been relaxing environmental standards in Wisconsin. Earlier this year, the DNR adopted a policy in which industries such as Kipp are not required to comply with the air quality standards for PM_{2.5}. For this reason, it is not expected that the DNR will ever determine if Kipp is complying with the air quality standards for PM_{2.5}.

Using the same procedures as SCS, I conducted an updated the modeling analysis of the approved particulate matter emissions from all of the stacks at Kipp's Atwood and Fair Oaks factories. This analysis followed DNR and USEPA approved procedures and is similar to analyses I have prepared and submitted to the DNR and other state regulatory agencies. The purpose of my analysis was to determine if Kipp complies with the air quality standards for PM_{2.5}. Based on information we have to date, this is the air pollutant from Kipp that creates the greatest risk to the health of surrounding residents.

The results of the updated modeling analysis are presented in Table 1. The maximum impact is nearly 2.5 times the 24-hour average standard and nearly 4 times the annual average standard.

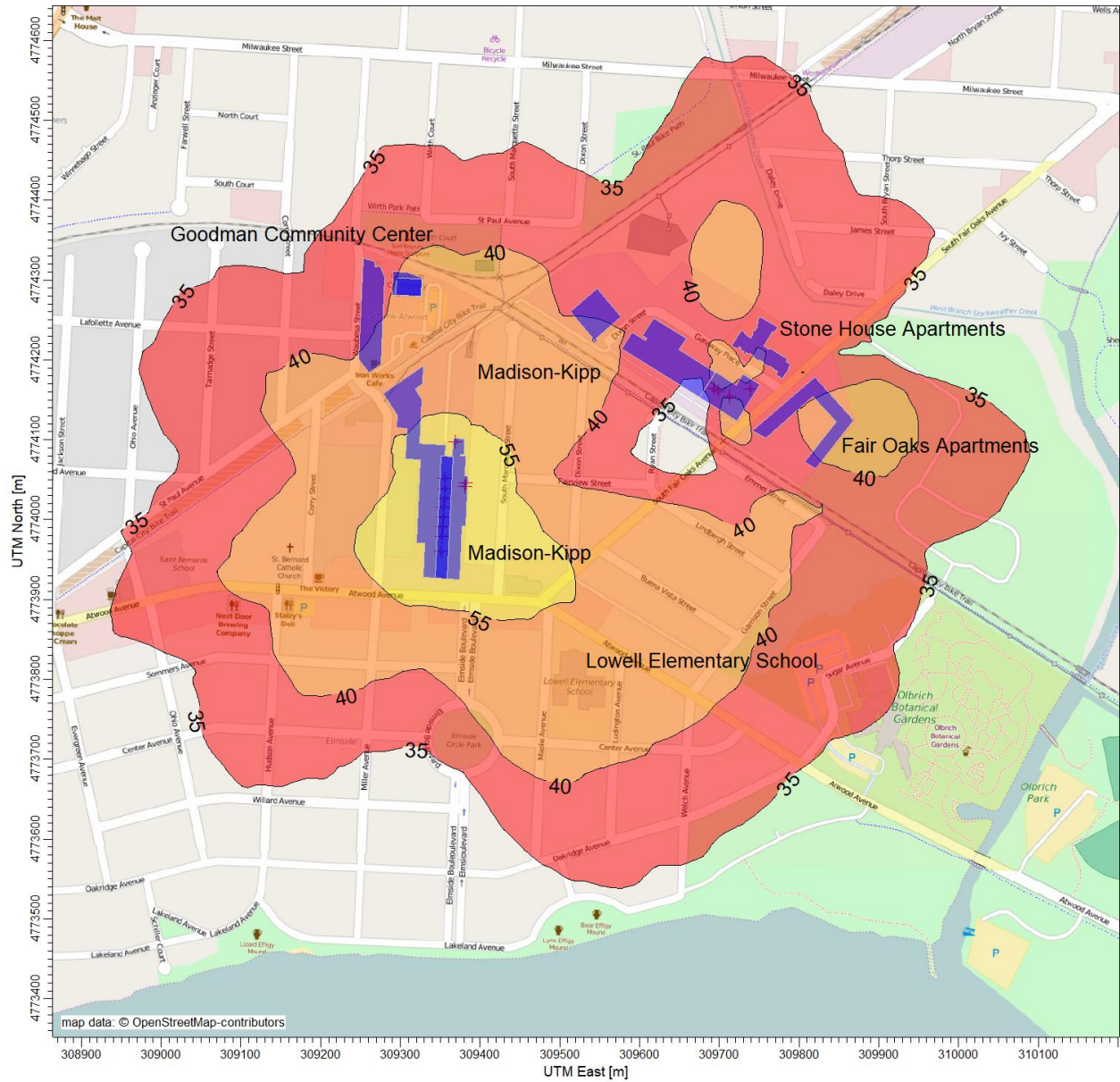
Table 1 - Air Quality Modeling Results for PM2.5 Emissions from Madison-Kipp

Averaging Period	Madison-Kipp (ug/m3)	Background (ug/m3)	Total Impact (ug/m3)	Air Standard (ug/m3)	Air Standard Exceeded?
24-hour	72.8	23.6	96.4	35	Yes
Annual	33.9	9.4	43.3	12	Yes

This modeling analysis also shows that Kipp exceeds both the 24-hour and the annual average air quality standards for PM2.5 at: 1) the proposed apartments at 131 South Fair Oaks Avenue; 2) the recently approved Stone House low income apartments across the street; and, 3) throughout the surrounding neighborhood.

Below are figures showing the extent of exceedences of the 24-hour average air quality standard for PM2.5 around the Atwood and Fair Oaks factories. These types of figures are similar to the ones I routinely prepare in my work on other air pollution control projects. The first figure shows the entire area around Kipp where exceedences of the air quality standard are predicted to occur. All colored areas in the figure are predicted to exceed the air quality standard. The locations of the Kipp factories on Atwood and Fair Oaks Avenues, of Lowell Elementary School, of the Goodman Community Center, of the Stone House low-income apartments and of the Inventure Capital apartments are provided. Both of the proposed apartment projects lie within areas exceeding the air quality standards.

The second figure specifically shows the area around the Kipp Fair Oaks factory which exceeds the air standard. The Stone House and Inventure Capital apartments are both located within this area.



24-hour Average PM2.5 Concentrations (ug per cubic meter) - All colored areas exceed the air quality standard.



Figure 1 - Predicted Exceedences of Air Quality Standards around Madison-Kipp Corporation

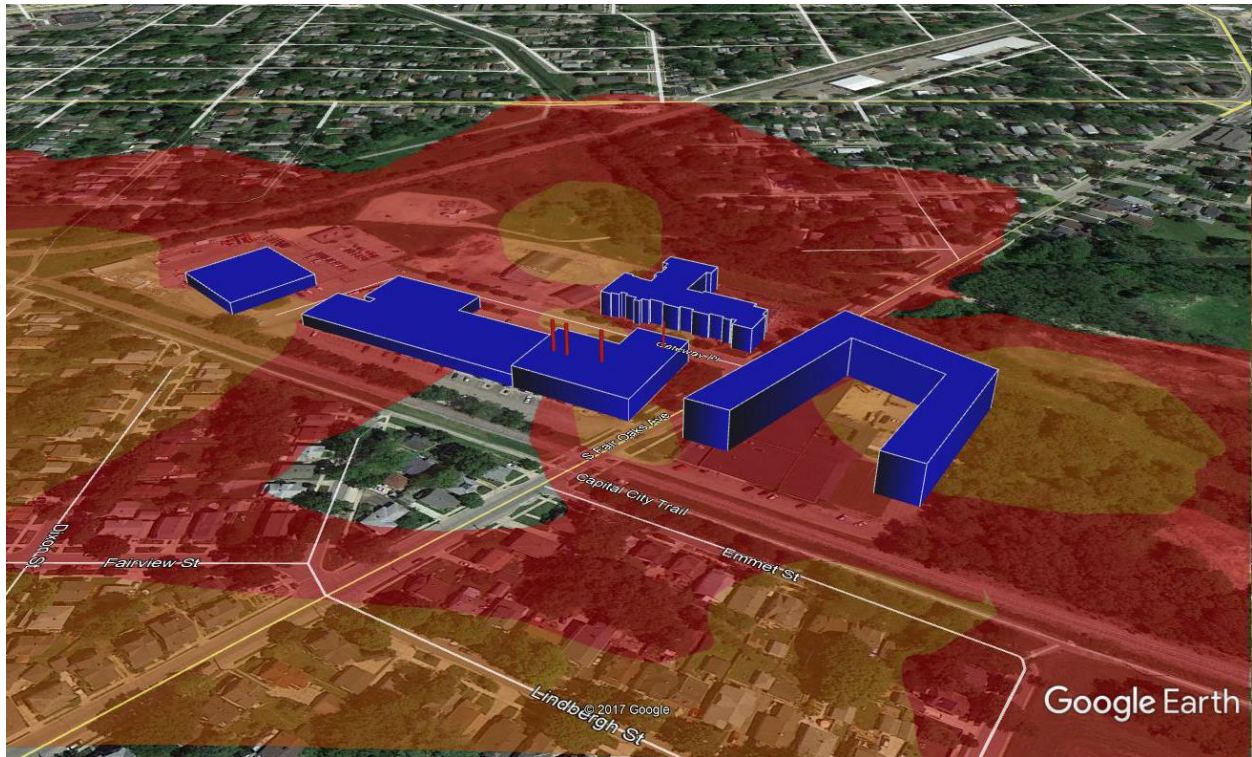


Figure 2 - Predicted Air Standard Exceedences around Madison-Kipp Corporation Fair Oaks Factory

REVIEW OF PHMDC MEMORANDUM FOR STONE HOUSE APARTMENTS

Another document that evaluated air quality concerns around Kipp was the December 8, 2017 memorandum, “Public Health Consideration of the Proposed Housing Development at 134 S Fair Oaks Avenue”, prepared by John Hausbeck from the PHMDC. With regard to air quality around Kipp, this memorandum makes several unsupported conclusions and presents no credible evidence.

Mr. Hausbeck concludes that:

“Public Health Madison and Dane County (PHMDC) has reviewed Kipp's air emission and process information in consultation with Wisconsin Department of Natural Resources (WDNR) and Department of Health Services (WDHS) and have found Kipp air pollutant emissions do not create a human health hazard or exceed existing air quality standards.”

Mr. Hausbeck provides no information and cites no documents to support this conclusion. As discussed above, the DNR has not evaluated Kipp compliance with air quality standards since 2007. At that time, Kipp installed numerous tall stacks to meet the old air quality standard of 150 ug/m³, an outdated standard which is far less protective of human health than the current fine particle standard of 35 ug/m³. Based on the DNR’s own analysis, Kipp is violating current air quality standards. The results of my updated modeling analysis presented in these comments confirm that Kipp is violating current air quality standards.

Mr. Hausbeck mentions voluntary changes Kipp has made to its operations. However, Mr. Hausbeck doesn't discuss the lack of DNR or city oversight of Kipp operations, or Kipp's legal ability to make significant changes to its operations without any public involvement. These changes can increase emissions or worsen air quality. Due to its industrial zoning, Kipp can add operations and increase its air pollution emissions without any oversight by the city or input from the surrounding neighborhood. For example, Kipp recently installed a new aluminum furnace at the Fair Oaks factory. SCS used this new furnace in its evaluation of air pollution from Kipp. This furnace did not require approval from either the DNR or from the city. Kipp could install many similar furnaces without any DNR or city oversight. Kipp could relocate all of its aluminum furnaces and die casting operations from the Atwood to the Fair Oaks factory without any approval by the DNR or city. While Kipp, after 20 years, voluntarily stopped using chlorine, it could begin to use chlorine again in its aluminum furnaces without requiring approval from the DNR or city. Mr. Hausbeck implies that the use of water and silicone wax lubricant in Kipp's die casting operations is safe. He doesn't mention the lack of any testing to determine the composition of the die casting fumes after the lubricant is partially burned by the molten aluminum, or the repeated requests by neighbors and Representative Taylor requesting these types of tests. Neither does he mention that the die casting operations were last tested for emissions in 1994, despite numerous requests by neighbors and Representative Taylor for updated testing.

Lastly, Mr. Hausbeck refers to the operation of an ambient monitor at Lowell Elementary School from 2005 to 2006 as evidence that air quality near Kipp is the same as elsewhere in Madison. This monitor was installed in response to parent concerns about proposed emission increases at Kipp. The parents asked for a continuous monitor located where their children played outside. However, the monitor was located on the roof of the school and operated every 3 days. It was not designed to measure impacts from Kipp but to measure background concentrations. Despite these shortcomings, this monitor measured exceedences of the air quality standards for PM_{2.5}. On August 5, 2005, this monitor measured 39.2 ug/m³ which exceeded the current 24-hour air quality standard of 35 ug/m³. The average of all measurements during the one year study was 14.0 ug/m³, which exceeded the current annual average standard of 12 ug/m³. The updated modeling analysis shows the greatest impacts from Kipp's stack emissions are close to the factories, not at Lowell Elementary. Mr. Hausbeck should not have used the Lowell measurements to prove homes or the proposed apartments closer to the factories are safe.

RECOMMENDATIONS

Neither of the proposed apartment complexes, the Stone House low-income development at 134 South Fair Oaks Avenue or the Inventure Capital development at 131 South Fair Oaks Avenue, should proceed until we better understand the composition of Kipp's emissions, and conduct air quality monitoring to confirm that Kipp complies with air quality standards.

To improve our understanding of air quality conditions in the neighborhood and to provide objective measurements, I recommend that ambient monitoring be conducted. Ambient air quality monitoring could be funded by the city, proposed apartment projects or the neighborhood noise abatement fund

which receives Kipp lease payments to the city. A few years ago Mayor Soglin used this fund to reimburse Kipp \$50,000 for the wooden fence it installed around its Atwood factory.

In recent years, lower cost monitoring equipment has been developed and put in use by the public throughout the U.S. and Europe. As an example, the USEPA manages the [Village Green Project](#) in several U.S. cities.¹ These are low-cost air quality monitoring stations in neighborhoods where air pollutants are continuously measured and results are published on the internet. The equipment cost for one of these stations is \$45,000. Ron Williams at (919) 541-2957 is the USEPA contact for this community monitoring program. Figure 3 provides a picture of a Village Green air quality monitoring station.

Mr. Williams is also a resource for information on other low-cost air quality monitoring equipment. For example, for PM2.5 monitoring he recommends the [MET-ONE](#) Neighborhood Monitor. This is a complete monitoring station which costs \$2,500, requires only electrical power, and uploads its measurements directly to the internet.² Several of these monitors could be sited throughout the neighborhood. These monitors could be located in all wind directions around the Kipp factories as well as at Lowell Elementary School and the proposed apartment projects on Fair Oaks Avenue. Neighborhood residents could be participate in the siting the monitors. Sky Patton is the contact at MET-ONE at (541) 471-7111.



Figure 3 - USEPA Village Green Air Quality Monitoring Station

¹ <https://www.epa.gov/air-research/village-green-project>

² <http://metone.com/>