

Harriet Tubman Middle School
Environmental Technical Advisory Committee

Meeting Minutes

October 29, 2018

4:00 – 6:00 pm

Attendees

Director Paul Anthony, Anthony Barnack, Dr. John Burnham, Dr. Raul Cal (remote), Mary Peveto, Joe Crelier, Dr. Jae Douglas, Megan Duenas, Daniel Forbes, Dr. Elliott Gall, Dr. Linda George, Dr. Christine Kendrick, Virginia LaForte, Aurelie Laguerre, Dr. William Lambert, Director Rita Moore, Mary Peveto, Tom Roick, Director Mike Rosen, Steve Simonson and Sarah Smith.

Agenda & Minutes

Building Update

Steve Simonson presented several photos of the newly remodeled interior and exterior. Included in the photos were:

- Construction activities for the seven foot diameter HVAC ductwork
- Aerial view of the completed HVAC ductwork
- Upstream and downstream of the HVAC activated carbon bank
- HVAC MERV 16 filter bank
- New gym floor
- Atrium
- Remodeled classrooms

Phase II Monitoring and HVAC Performance

Dr. Gall began with a presentation entitled Harriet Tubman Middle School Air Quality Monitoring Phase II. He reminded ETAC members of the three phases (Phases I-III) of air monitoring planned for Tubman, also reviewed were four findings from Phase I. The four goals of Phase II were:

- Goal 1 - Characterize the indoor and outdoor air quality at HTMS following renovation.
- Goal 2 - Is the HVAC air cleaning system performing as designed?
- Goal 3 - To what extent is there infiltration of outdoor pollutants through the building envelope?
- Goal 4 - How do air pollution levels vary spatially near vicinity HTMS?

There were unanticipated monitoring delays:

- Wildfire smoke events – Abated mid 9/18
- Ongoing presence of diesel powered construction equipment – Abated 10/3
- Construction/Renovation/Cleanup inside and outside the building – Abated 10/6
- HVAC not fully operational – Tuning/balancing mid to late 9/18

Air quality sampling overview:

- Particles in Air Handling Unit (AHU) – Black carbon, PM_{2.5}, PM₁₀ and ultrafine particles (UFP)
- Gas Phase in AHU – NO, NO₂, VOC, CO and CO₂
- Indoor/Outdoor Sampling – Purple Air network, UFP transects and passive NO₂ sensors

Site Meteorology

- Wind direction
- Wind speed
- Temperature
- Humidity

Monitoring results were then presented for each of the four Phase II goals:

Goal 1 - Monitoring Results

- Indoor black carbon, UFP and NO₂ are substantially below outdoor levels
- Indoor toluene and xylenes below Oregon Airborne Benchmark Concentrations (ABC)
- Benzene below outdoor levels and Portland background levels, but slightly above ABC

Goal 2 - HVAC Performance

- Particle removal generally effective
- Lower than expected PM₁₀ removal possibly due to resuspension. May improve
- Ethyl benzene and Xylene in line with manufacture's removal statement
- Benzene and Toluene lower removal than expected
- Need to confirm flow rate for AHU
- Timing of outdoor air supply – Explore delayed startup of outdoor air intake

Question: Will Dr. Lambert address PM₁₀, benzene and toluene risk? Answer (Dr. Lambert): Yes

Goal 3 - Pollutant Infiltration Via Building Envelope

Pollutant infiltration of the building envelope occurs when the outdoor air enters the building through pathways outside of the AHU. In these instances, indoor contaminant exposure levels do not equal supply air contaminant levels leaving the AHU.

Ratios of return air contaminant levels divided by outdoor contaminant levels are good indicators of pollutant infiltration and can indicate indoor sources of pollutants. For example:

Black Carbon RA/OA = 0.17

UFP RA/OA = 0.044

PM_{2.5} RA/OA = 0.42

PM₁₀ = 0.62

NO₂ = 0.51

Black carbon and UFP ratios indicate that building is protective. PM_{2.5} and PM₁₀ ratios indicate indoor sources. NO₂ ratio indicates building infiltration of gases.

Question (Dr. Rita Moore): Is the HVAC always working when occupied?_Answer (Steve Simonson): HVAC kicks in one hour before occupancy. Could start earlier.

Goal 4 - How Do Contaminants Vary Spatially In the Vicinity of HTMS

Ultrafine particles and NO₂ measurements were conducted inside Tubman and around the building. Measurements were also taken in Lillis Albina Park and the neighborhood east of Tubman.

A summary of Goal 4 stated that “Outdoor levels of NO₂ and UFP were elevated at HTMS compared to urban background in the morning and near the freeway.” In addition, “UFP and NO₂ are significantly reduced indoors compared to outdoor levels.”

The remainder of the presentation covered graphs depicting the detailed data collected for return air, supply air and outdoor air.

Implications of Outdoor/Indoor Air Monitoring for Health Risk

Dr. Lambert began by presenting the levels of contaminants monitored by PSU and comparing them to EPA NAAQS standards. Specifically, he compared carbon monoxide, nitrogen dioxide and PM_{2.5} to these standards and black carbon to Oregon Airborne Benchmark Concentrations (ABCs).

These comparisons indicated that the three contaminants in outdoor air were all below the federal standards. The data also clearly shows that nitrogen dioxide and PM_{2.5} are both nicely scrubbed by the AHU filter beds. Black carbon in outdoor air is above ABCs however, but “well scrubbed” by the filter bed and below ABCs indoors. Oregon ABCs are state goals. Black carbon is assumed to originate from diesel engines.

Question (Dr. Rita Moore): Is HVAC scrubbing black carbon? Answer (Dr. Gall): Yes, removing 90%.

Outdoor and return air monitoring data for a number of volatile organic compounds (VOC), benzene, toluene, xylenes and ethyl benzene were compared to Portland background levels and Oregon ABCs. Each of these are at or below background and ABCs except benzene. Dr. Lambert stated that "Indoor average levels of VOCs are below the Oregon DEQ's ABCs, except for benzene. However, indoor benzene levels are substantially reduced." ABCs represent protection against one excess cancer in-a-million over a 70 year exposure.

PM_{2.5} classroom levels are less than 10% of outdoor levels while outdoor levels of PM_{2.5} drop substantially by late morning. Basketball court levels are greater than roof levels adjacent to HVAC intake.

UFP - A table was presented showing the UFP transect data. Levels range from 43,000/cm³ between 9-10 AM and 6,600/cm³ after 3:34 PM.

Dr. Lambert then presented the limitations on conducting a risk assessment.

- Further monitoring is needed to evaluate the consistency of HVAC performance over a longer period of time.
- Adjustments in the delivery of filtered air to various indoor zones may further reduce infiltration of particles and NO₂ through walls and windows.
- Adjustment of flow rates in the air handling system may optimize residence time to achieve greater removal of VOCs in the carbon bed.

Because Phase II monitoring will be following by Phase III monitoring in April/May of 2019, Dr. Lambert presented preliminary conclusions concerning risk.

Preliminary Conclusions

- Early monitoring provides evidence that the HVAC system is generally performing according to design specifications.
- The air delivered to indoor locations in the school is safe and supportive of health for students and staff.
- As we observed in March-April, the highest outdoor levels of roadway pollutants occur in the morning hours.
- Even though the outdoor levels of the major pollutants are elevated, they remain below levels of health concern as compared against the available federal health standards.
- The HVAC filtration and carbon bed system reduces these levels even further.

Questions (Mary Peveto): Have we provided monitoring data to folks who live nearby? Answer (Dr. Lambert): We have talked about sensitive groups. There is an adequate level of safety.

Should provide data for elevated day. HVAC serves to prevent sustained exposures to students and staff. Students have short-term exposure while outside. We have provided advice to reduce these exposures. (This commenced an extended committee discussion involving the basketball court and students going outdoors in the morning hours.)

Wind Tunnel Modeling

The work presented by PSU for the wind tunnel project included process and rationale for experiments to be done. These include four variations, wall/no-wall and current/expansion, along with four wind directions. The manufacturing of the scaled models was outlined along with the techniques and photos. Preliminary measurements were shown for the south direction at two locations. One approaching HTMS and one over HTMS. The results presented were mean wind velocity and turbulence which are markers for predominant wind direction and mixing, respectively. The evolution of these quantities were explained. Further analysis as well as other wind directions will be presented at the next meeting.

Next Meeting

The next meeting will take place after Phase III monitoring is complete. This will provide Dr. Lambert with data to conduct a health risk assessment and allow an assessment of HVAC performance after a full school year.