James R. MacNeal

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Testimony regarding HR 247 **January 22, 2020**

Good morning Chairman Vitale, Vice Chair Kick, Ranking Member Denson, HR 247 Sponsor Roemer, Co-sponsors Grendell et al, and members of the House Energy and Natural Resources committee.

My name is James MacNeal. I am a resident of Troy Township in Geauga County. I am a Specialty Gases chemist and former Team Coordinator for the Geauga County HAZMAT Team. I have spent much of my career working with EPA Protocol calibration gases to support companies striving to establish and maintain compliance with the requirements of Title 40 parts 75 and 1065 of the Code of Federal Regulations. I have worked personally with the calibration gases required for mobile emissions testing under part 51 of 40 CFR.

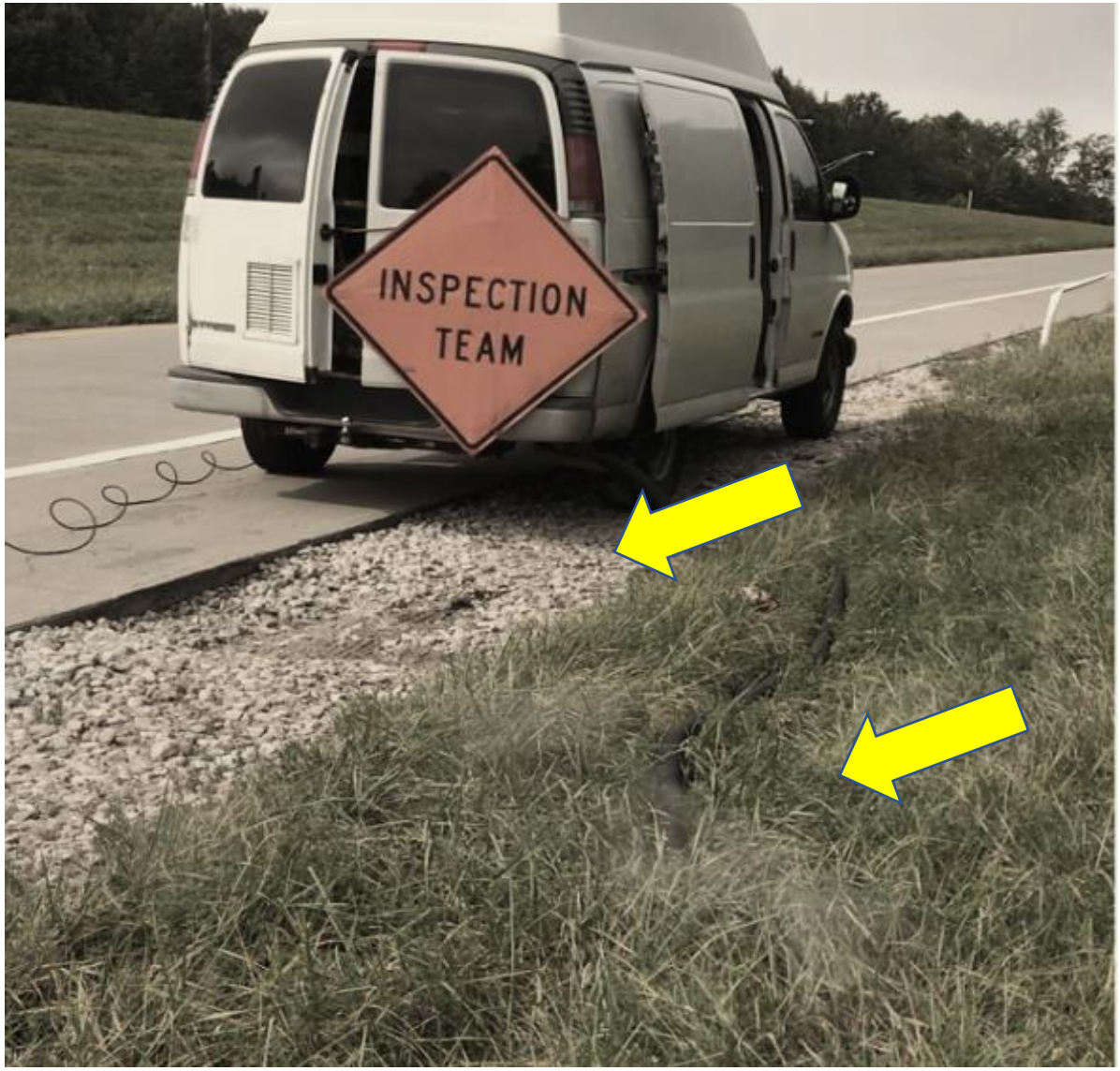
These are the regulations governing Continuous Emissions Monitoring (CEMs) such as those from Electrical Utility Power Plants, and Vehicle Emissions monitoring (VE) such as Auto manufacturer on-road emissions testing.

Thank you for this unique opportunity to testify in support of HR 247. I will present information which, in my opinion, may show that some or perhaps all the data collected by Ohio EPA's mobile E Check, may be contaminated or corrupted and if so, may then therefore be invalid.

Ohio EPA mobile E check monitoring operation.

Date: Thursday September 12, 2019

Location: Westbound ramp from OH 44 onto US 422. Auburn Township, Geauga County, Ohio



Thursday September 12, 2019

Ohio EPA mobile E check monitoring operation.

The test vehicle engine must remain running to power the analytical instrumentation on board.

The black tube at the vehicle's right rear conducts the vehicle's exhaust away from the test vehicle.

The arrows point to the test vehicle's exhaust drifting from right to left, directly and variably into the sampling zone. Gases to be analyzed are invisible. The faint white plume is condensed water vapor from the vehicle's exhaust, which is the only visible component of the exhaust gases.

These sequential photos show that variable amounts of the test vehicle's exhaust are entering the sample zone. The variability of exhaust gases entering the sample zone is important as we shall shortly see.

September 12, 2019 was the fourth time I observed the test vehicle operating with the wind carrying its exhaust into the sample zone. I have additional still photos from May 2019, but September 12 was the first opportunity I had to video actual operations under these weather conditions. The actual video is much clearer with respect to visualizing the exhaust gas path into the sample zone. I can make it available should any of you wish to have a copy.

September 12. 2019

Ohio EPA mobile E check monitoring operation.

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Here we see traffic entering the sampling zone. The device in the foreground is part of the instrumentation that detects exhaust gases and measures their concentrations.

The sample zone can possibly become contaminated by the test vehicle's own exhaust being drawn in behind the test vehicle.

Attempts to convey test vehicle's exhaust gases away through the black exhaust hose are demonstrably ineffective.

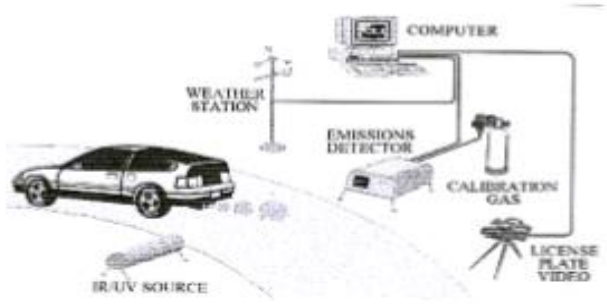
ESP is a System used in mobile E check and is shown in the photos included in this testimony. Here is an Excerpt from the ESP AccuScan Literature.

4. Equipment Specifications and Measurement Procedures

4.1. The Remote Sensing System

Figure 4.1 shows a generic diagram of an RSD system which measures CO, CO2, HC, NO, and smoke opacity set up along a single lane of road. The make and model year of the vehicle are identified from the video picture.

Figure 4.1: RSD Operational Diagram



4.2. Theory of Operation

Remote Sensing Devices have been designed to emulate the results one would obtain using a conventional exhaust gas analyzers. Because the effective plume path length and amount of plume seen depend on turbulence and wind, one can only determine ratios of CO, HC, or NO to CO2. Assuming complete and instantaneous mixing, these ratios, Q for CO/CO2, Q' for HC/CO2, and Q" for NO/CO2 are constant for a given exhaust plume. By themselves, Q and Q' are useful parameters with which to describe the combustion system. When the corresponding combustion equations are solved many components of the vehicle operating characteristics can be determined including the instantaneous air/fuel ratio and the % CO,% HC, and % NO which would be read by a tailpipe probe. The equations given below are based upon a carbon mass balance and make use of the fact that the IR HC analysis method only measures about one half of the carbon which would be measured by means of an FID for instance.

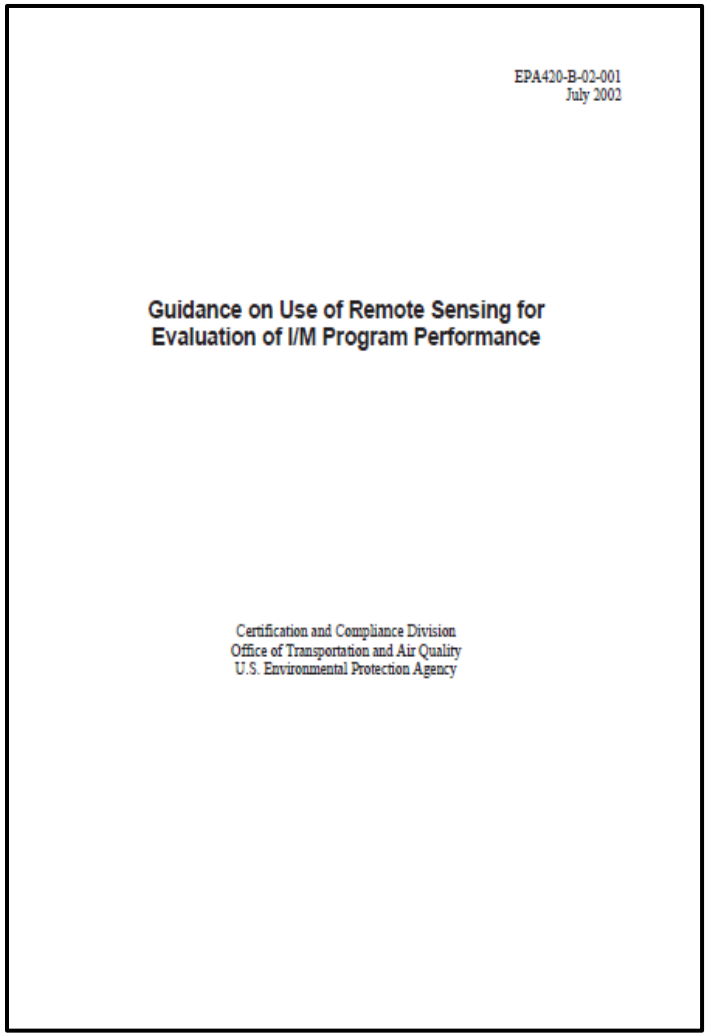
$$\%\,CO2 = 42/(2.79 + 2Q + 0.84Q')$$
$$\%\,CO = Q * (\%\,CO2)$$
$$\%\,HC = Q' * (\%\,CO2)$$
$$\%\,NO = Q'' * (\%\,CO2)$$

To derive mass emissions in g/gal of fuel from Q and Q' a fuel density of 0.75 g/mL and the carbon-hydrogen ratio of 1:2 are assumed to yield:

FINAL - 12 -

NOTE the weather station assumed to be in the loop.

The Nearest weather station to the actual test site is about 1/4 to 1/2 mile away. Even IF it is communicating weather data to the test vehicle computer, the data is for the exact point where the weather station is located. The weather station cannot monitor the wind directly at the outlet of the vehicle's exhaust hose and sample zone simultaneously.



EPA420-B-02-001
July 2002

Guidance on Use of Remote Sensing for
Evaluation of I/M Program Performance

Certification and Compliance Division
Office of Transportation and Air Quality
U.S. Environmental Protection Agency

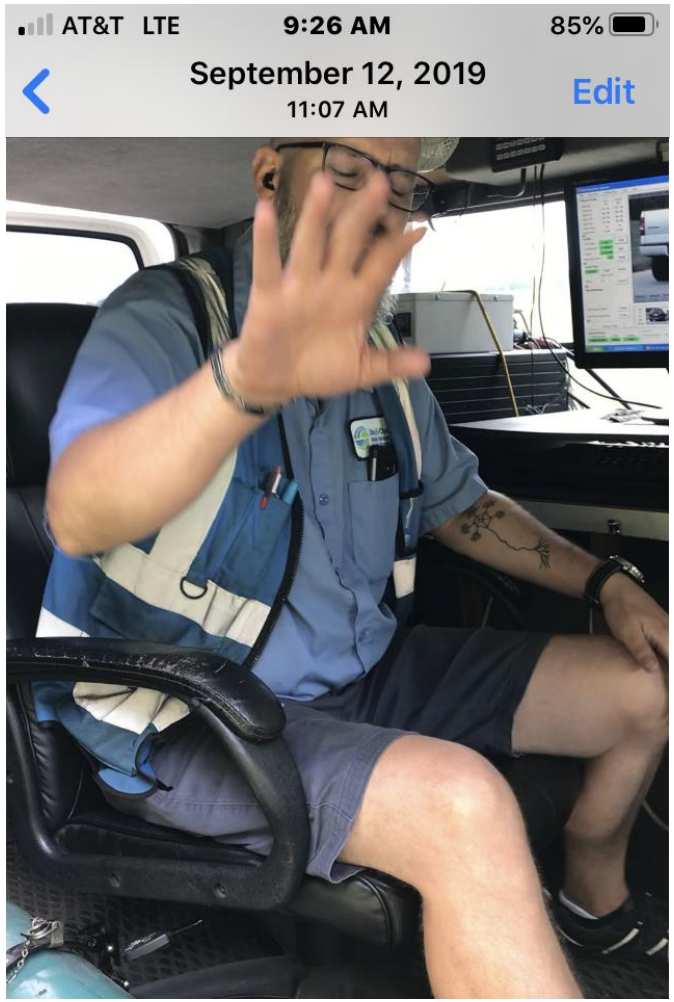
Comments from US EPA (mobile emissions monitoring) Guidance Document 420-B-02-001 July 2002;

"For example, if a person blocks the beam and exhales into it during the 1/2 sec. after they have unblocked the beam, the computer sees the exhaled CO2, finds no CO, HC, or NO, and reports zeros for those pollutants and about 15% CO2. Exhaled breath rarely contains even 2% CO2, but the system only measures the ratios, and assumes (incorrectly in this case) that the emissions are from a fully stoichiometric automobile using gasoline as fuel. **A puff from a cylinder which contains 50% CO and 50% CO2 would be read as 8.6% CO and 8.6% CO2 because the ratio is what is measured not the absolute concentrations."**

Extraneous gases (i.e., test vehicle's exhaust), if introduced into the sample zone, can change the data obtained.

There appears to be no provision or capability in the measurement system or remote weather sensing to compensate for a stationary vehicle located literally in the sample zone, whose extraneous vehicle exhaust enters the sample zone.

Extraneous vehicle exhaust is variable depending on instantaneous wind speed, direction and engine rpm. *Such extraneous exhaust gases can variably contaminate the sampling system in a fashion for which there is no apparent correction factor.*



Ohio EPA mobile E check monitoring operation.

The Technician inside the test vehicle is not very happy about me photographing the vehicle and test system in operation.

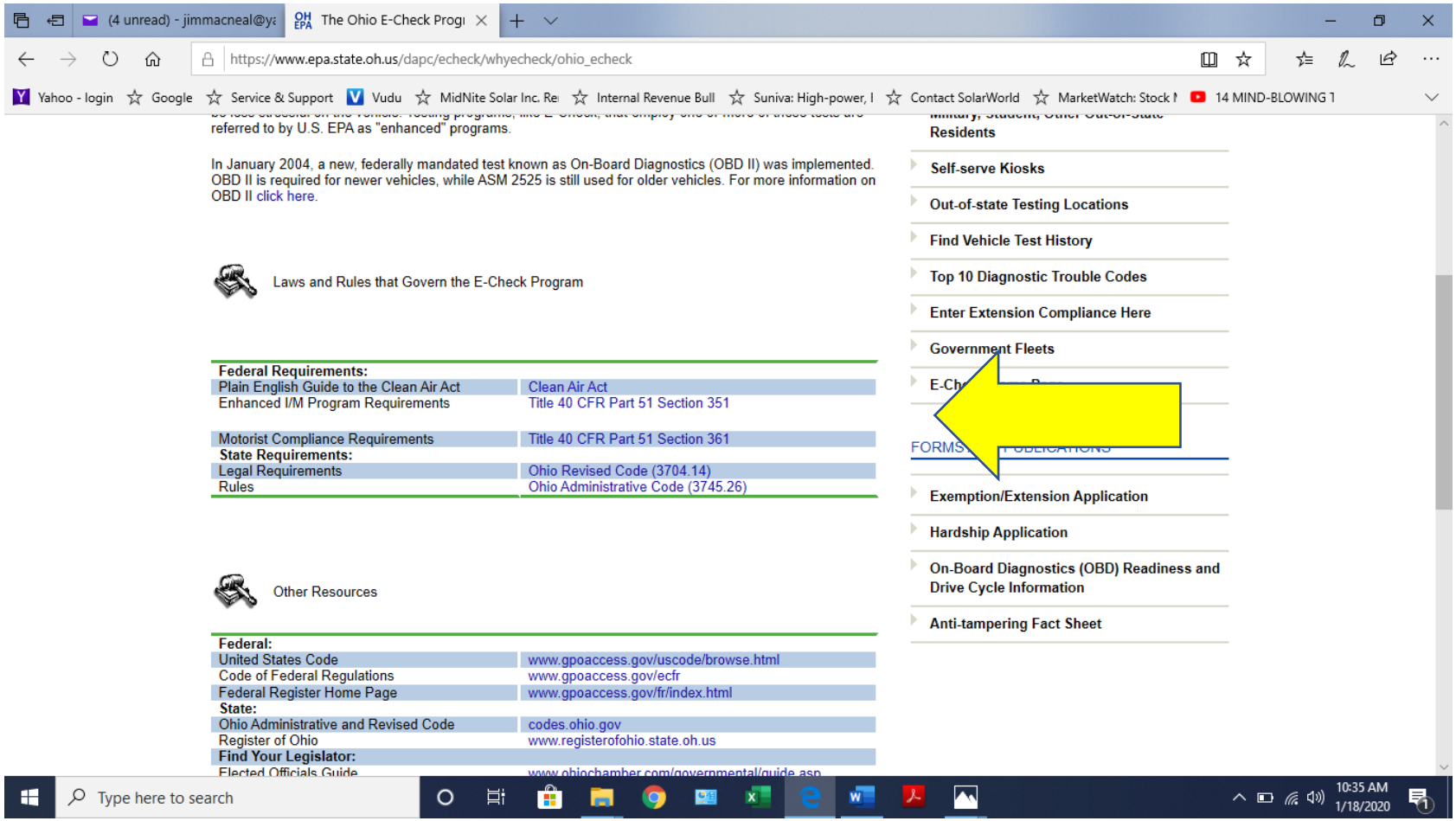
This gesture is in response to my question" Do you have an anemometer or any wind direction and speed instrumentation in operation?"

The Technician answered that "I don't know. It's not in my pay grade."

For the record, he is a fine fellow but was not feeling very comfortable at the moment.

The necessity for, and origin of, vehicle emissions monitoring in Ohio was established with EPA's 1990s air testing outside Browns Stadium in Cleveland, OH - *AFTER* games- while the crowds were leaving. (Hon. James Trakas' testimony 19 November 2019). **E Check is also part of the penalties for Geauga County's Ground Level Ozone non-compliance; a factor that is largely beyond Geauga County's control, originating in Cleveland.**

US EPA Regulations required OH vehicle exhaust emissions testing. STATIONARY testing began January 1996.



James R. MacNeal Testimony Wednesday January 22, 2020, Ohio House of Representatives Energy and Natural resources Committee

In July of 2012, RapidScreen (aka “Mobile E check) was implemented in Northeast Ohio

RapidScreen

What is RapidScreen and how does it work?

Beginning in July 2012, our RapidScreen vans will travel throughout Northeast Ohio and will be remotely scanning vehicles as they drive by. If the vehicle records two clean RapidScreen readings within a nine-month window in the year prior to its registration renewal date, the owner will receive a notification in the mail and on the vehicle’s registration renewal application.

The next paragraph from the web site is a logical and testing conundrum:

To ensure accurate and uncontaminated readings, the emissions limits for RapidScreen are stricter than those of a standard tailpipe emissions test. Therefore, it is possible to fail to meet RapidScreen’s strict qualifications, but still be able to pass an emissions inspection at a testing facility. If your vehicle fails to meet RapidScreen’s strict qualifications, the need for a standard emissions test will be indicated on your registration renewal application.

Per OH EPA: Only about 5% of vehicles will pass or qualify to be screened by RapidScreen

So…why do Mobile E check at all??

OH EPA ‘s web site shows that on January 1, 2020, On Board Diagnostics (OBD) became the exclusive vehicle compliance method for Clean Air Act compliance…. obsoleting tailpipe gas analysis methods.

Ohio Environmental Protection Agency

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Welcome to the Ohio E-Check Homepage

The Clean Air Act requires 31 state and local areas to conduct vehicle inspection and maintenance programs to control vehicle emissions and help meet national air quality standards.

In Jan. 1996, the State of Ohio began a new vehicle emissions testing program, E-Check, designed to identify motor vehicles that emit excessive levels of pollutants into the air. Among the other emissions control options considered by legislature, E-Check was the most cost-efficient measure to reduce the volatile organic compounds (VOCs) that form ground-level ozone, or smog. The program currently tests cars in seven Ohio counties.

E-Check Station Closings: In the event of extended power outages or extreme winter weather/snow storms, please click here for possible station closings/updates.

Important Announcement

Beginning January 1, 2020, the Ohio E-Check program will be conducted exclusively through the use of the OBDII test and the tailpipe method of testing will be discontinued.

The Ohio E-Check Program currently includes two inspection procedures. Depending on the model year, each vehicle is currently subjected to either:

- a tailpipe emission test (for 1995 and older vehicles); or
- an inspection of its On-Board Diagnostic II (OBD II) system, which independently monitors the

a commitment to clean air

1-800-CAR-TEST
(1-800-227-8378)
Testing Locations
Feedback

QUICK LINKS

- nd the Closest Testing Location
- ormation
- hat if my vehicle fails E-Check?
- Multi-year Registration Testing Requirements
- Military, Student, Other Out-of-State Residents

So why is mobile E check *still in existence*?

OH EPA's Rapid Screen web site schedule shows continued operations

beyond the end of standard E check tailpipe analysis methodology

RapidScreen Schedule from OH EPA web site

Date	City	Intersection	Times
Monday, Jan 13, 2020	Auburn Twp	On ramp to WB US 422 from Ravenna Road (OH 44)	8 a.m. to 4 p.m.
Tuesday, Jan 14, 2020	Auburn Twp	On ramp to WB US 422 from Ravenna Road (OH 44)	8 a.m. to 4 p.m.
Wednesday, Jan 15, 2020	Auburn Twp	On ramp to WB US 422 from Ravenna Road (OH 44)	8 a.m. to 4 p.m.
Friday, Jan 17, 2020	Auburn Twp	On ramp to WB US 422 from Ravenna Road (OH 44)	8 a.m. to 4 p.m.
Tuesday, Jan 21, 2020	Medina	On ramp to SB I-71 from Medina Road (18)	8 a.m. to 4 p.m.
Wednesday, Jan 22, 2020	Medina	On ramp to SB I-71 from Medina Road (18)	8 a.m. to 4 p.m.
Friday, Jan 24, 2020	Medina	On ramp to SB I-71 from Medina Road (18)	8 a.m. to 4 p.m.

Note: To ensure accurate and uncontaminated readings, RapidScreen testing vans do not operate during rain, snow, high winds or other adverse weather conditions.

The mobile E check system appears incapable of detecting and compensating for the test vehicle's exhaust entering the actual sample zone. This would appear, in my opinion, to render the measurements taken under such circumstances highly suspicious and potentially invalid.

The "pass rate" of vehicles in mobile E check emissions measurements is under 5% (per the OH EPA web site). Even at that, sampling can apparently be contaminated. This begs the question of why we are incurring the expense for such a program? Especially if the stationary, more accurate systems have ALREADY ceased operation in favor of the OBD. As well, where does the data go? What is its use in Air Quality evaluations?

Considering the information presented here, it is my opinion that it is questionable whether the Mobile E check program has done anything provable to support the mission of reducing air pollution from vehicles. Does such a situation merit continuance of the Mobile E check program or should it be immediately discontinued?

While the overall E check program may have made minor contributions to improving air quality, it is no longer needed because the automobiles have become so sophisticated that the autos themselves tell the owners when there is a problem that affects emissions, AND as US EPA reports, the air is unquestionably cleaner than it has been, with massive improvements since 1990.

It is my opinion that the entire E check program is no longer needed. In my opinion, due to its questionable performance, it is a good candidate for immediate termination.

Thank You Chairman Vitale, Vice Chair Kick, Ranking Member Denson, HR 247 Sponsor Roemer, Co-sponsors Grendell et al, and members of the House Energy and Natural Resources committee for this opportunity.

I would be pleased to answer any questions that you may have