



Diesel Particulate Matter in Providence: *Local Diesel Sources and Solutions*

A project of the:

Rhode Island Diesel Pollution Initiative (RIDPI)

Written by: Madeleine Weil, Environment Northeast



RIDPI, the Rhode Island Diesel Pollution Initiative,

is an association of organizations dedicated to significantly reducing health risks from diesel pollution in Rhode Island.

We are a growing coalition led by the **American Lung Association of RI, Clean Water Action, Environment Northeast, Rhode Island PIRG, RI Chapter of the Sierra Club, and Ocean State Clean Cities Coalition.**

We would like to thank the **Clean Air Task Force, especially Dr. Bruce Hill and James Gooch**, for providing monitoring instruments and technical assistance, as well as several of the graphics and digital photographs used in this report.

Summary

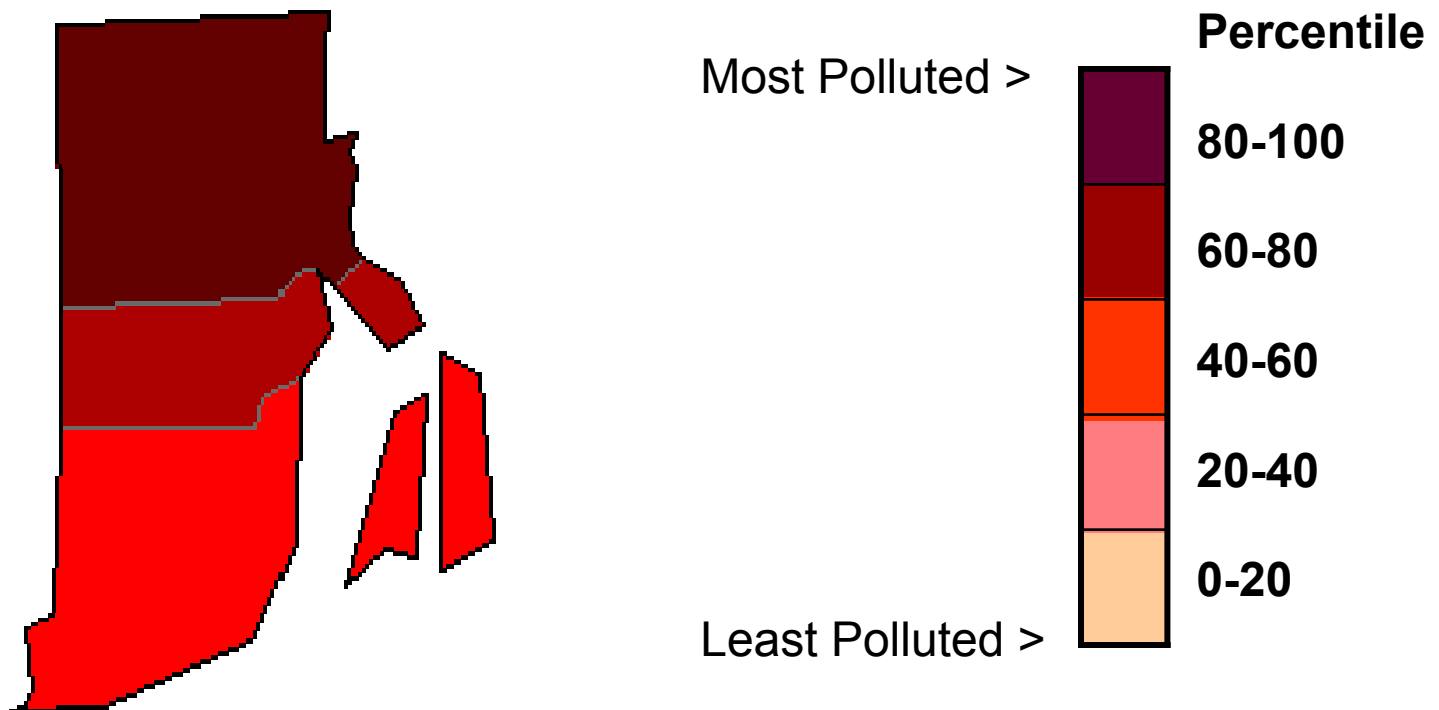
- Providence is home to significant heavy duty diesel traffic
- Diesel traffic in Providence generates fine particulate matter (PM_{2.5}) and ultrafine particulate matter pollution which:
 - contributes to elevated levels of air pollution
 - is known to harm human health
- Solutions – cleaner fuels, retrofit emission controls, and reduced idling:
 - are feasible, readily available and affordable
 - will significantly reduce local diesel pollution
 - will improve local air quality and human health

Why Providence?

- The American Lung Association gave Providence a grade “D” for particle pollution and an “F” for ozone pollution
- More than 100,000 Rhode Island residents have asthma
- RI residents, especially Providence County, suffer some of the highest exposures to diesel pollution in the country

RI Diesel Particulate Concentrations

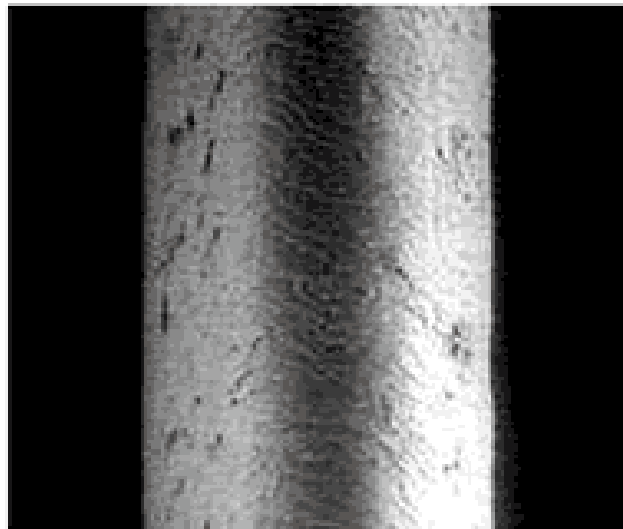
Percentiles compare directly-emitted fine particle concentrations in RI counties versus other U.S. counties (1999 data)



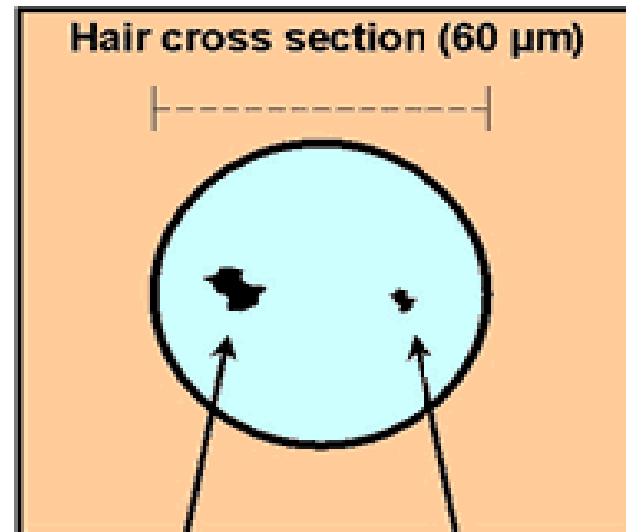
Source: Clean Air Task Force, *Diesel and Health in America: The Lingering Threat*.
www.catf.us/goto/ENEdieselhealth

PM2.5 = Fine Particulate Matter

HOW SMALL IS PM?



Human Hair
(60 μm diameter)



PM10
(10 μm)

PM2.5
(2.5 μm)

Source: U.S. EPA

Why Does Particulate Matter?

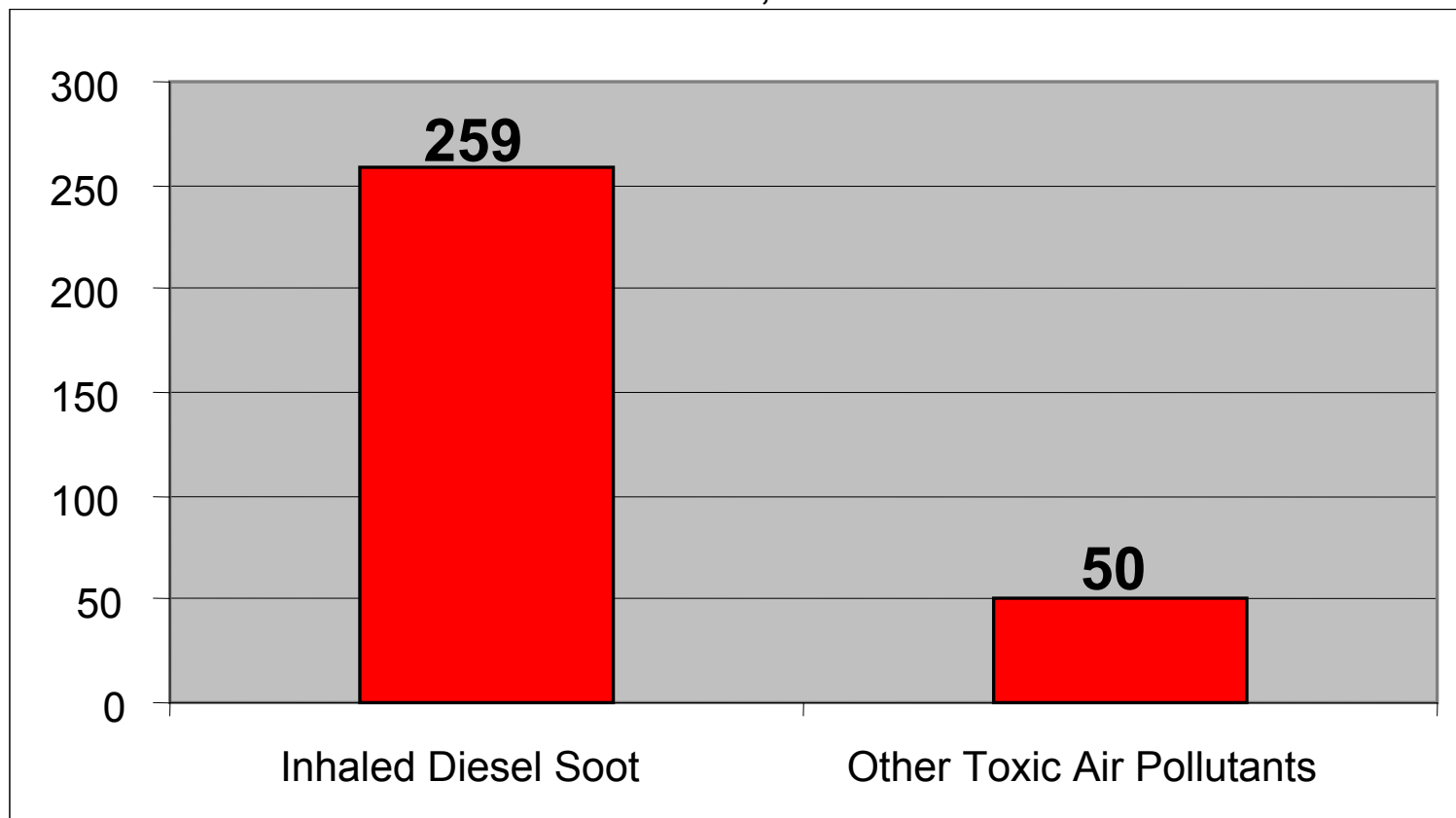
Diesel Health Impacts in RI

- Each year, diesel particulate matter emissions in RI cause approximately:
 - 50 premature deaths
 - 80 non-fatal heart attacks
 - 900 asthma attacks
 - 5500 missed-work days
 - 32,000 restricted activity days
- Providence County ranks within hardest-hit top 5% of all U.S. counties for diesel health impacts
- Average lifetime diesel soot cancer risk for a Providence County resident is 330 times EPA's acceptable risk level
- Estimated non-fatal health damages in RI are more than \$26 million per year

Source: Clean Air Task Force, *Diesel and Health in America: The Lingering Threat*.
www.catf.us/goto/ENEdieselhealth

Local Cancer Risk From Diesel Soot

Diesel soot causes five times more lifetime cancers per million in the Providence-New Bedford-Fall River, RI-MA MSA than other air toxics



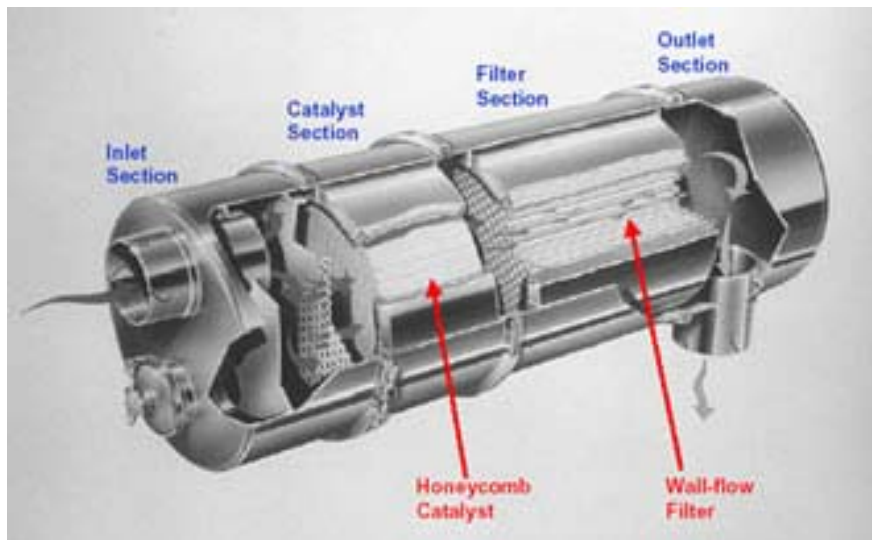
Source: Clean Air Task Force, *Diesel and Health in America: The Lingering Threat*.
www.catf.us/goto/ENEdieselhealth

Why Now?

- Federal (EPA) rules do not adequately prevent pollution from “in-use” heavy duty diesel engines:
 - EPA’s new emission standards will produce new engines 90% cleaner than existing ones
 - Because heavy-duty diesel engines often last 15-35 years, older dirtier engines will be on our roads and jobsites for years to come
 - BUT....

The Opportunity

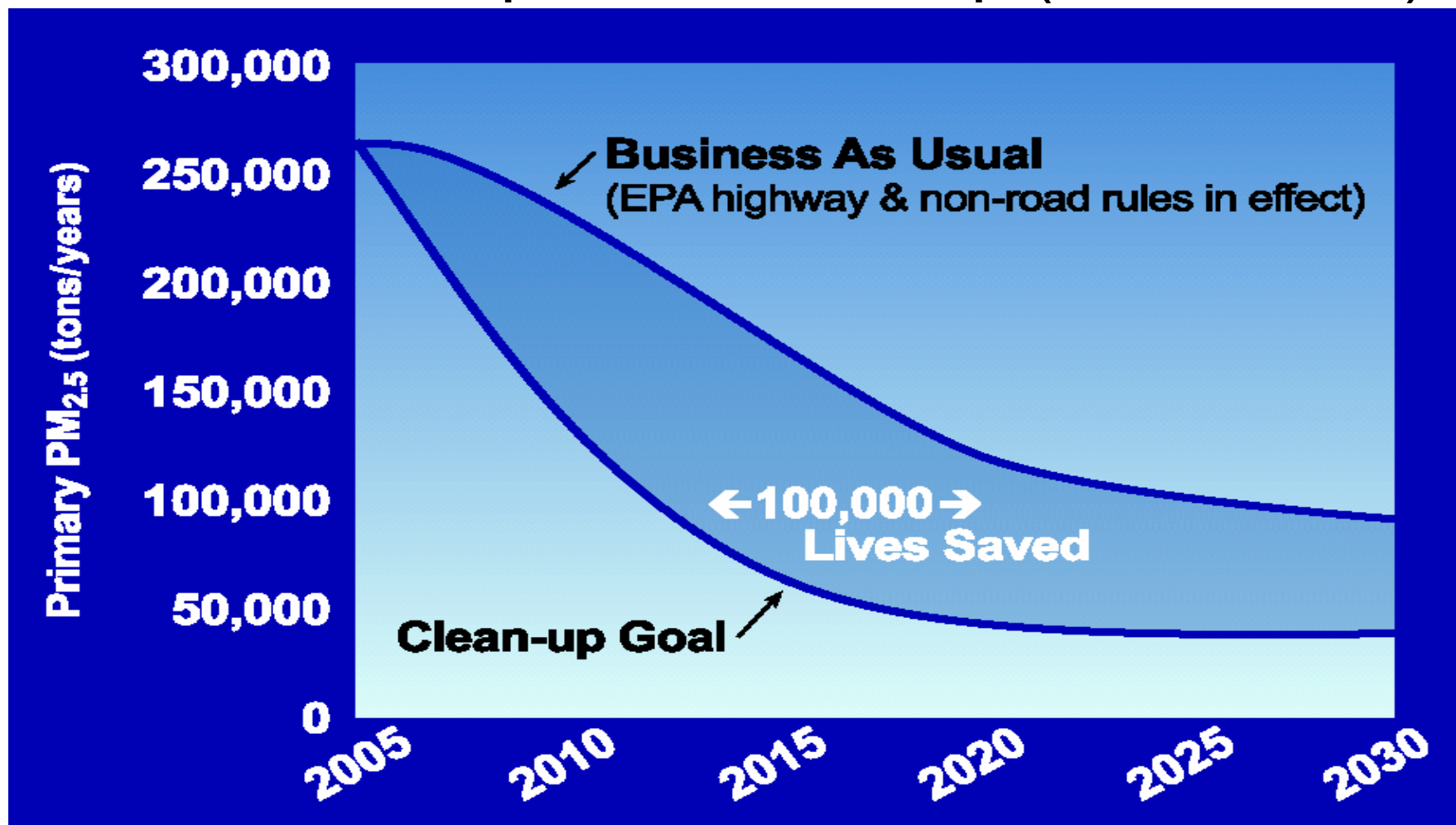
- New technologies and fuels make it possible to clean up these “in-use” engines now



A Diesel Particulate Filter can reduce diesel soot by more than 90% from many engines

What's at Stake?

Benefits of Proposed Clean-Up (Nationwide)



Source: Clean Air Task Force, *Diesel and Health in America: The Lingering Threat*.

www.catf.us/goto/ENEdieselhealth

RIDPI Monitoring Project Objectives

- Report findings to city and state policymakers, community groups
- Raise awareness about diesel problems & solutions
- Identify priority local opportunities to cut pollution
- Work with concerned citizens to promote diesel clean-up

Gathering Data

Participants helped experts monitor particulate matter (PM) levels in the air near where diesel vehicles operate

- Participants from:
 - Environment Northeast
 - Clean Water Action
 - RI Public Interest Research Group
 - American Lung Association
- Monitoring and Data:
 - Clean Air Task Force
- Dates
 - July 26-27, 2005





Graphs and Images

PM2.5 and Ultrafine Particle Measurements, July 26-27, 2005

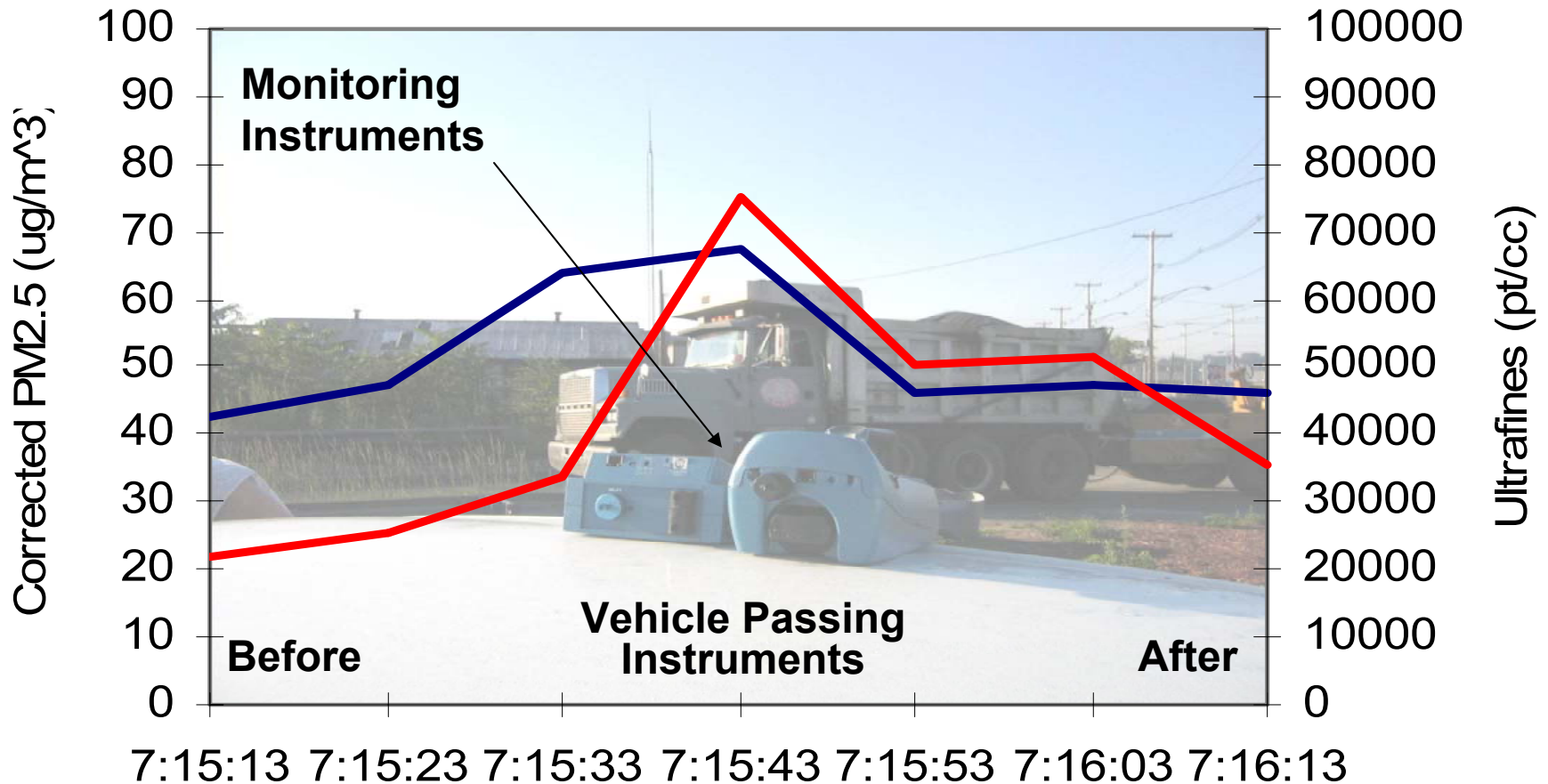
Location 1 – Allens Avenue and I-95

Location 2 – Rhode Island Landfill

Note: Raw measurements of PM2.5 mass from the DustTrak were divided by 2.5 as an approximate calibration to DEP hourly monitoring data. See Slide 34 for more details.

Illustration Image

I-95 Onramp at Allens Avenue



What do graphs tell us?

- The blue line corresponds to the left Y-axis and measures corrected mass of PM2.5 in micrograms per cubic meter ($\mu\text{g}/\text{m}^3$)
- The red line corresponds to the right Y-axis and measures the number of ultrafine particles in a cubic centimeter of air (pt/cc)
- Graphs represent changes over time in measured PM2.5 and ultrafine levels
- Graphs demonstrate that passing diesels have an immediate, short-term impact on measured PM2.5 and ultrafine levels near the roadway
- Graphs do not represent absolute concentration levels, exposure levels, or levels of health risk

Allens Ave - Description of Site

Allen's Ave Offramp

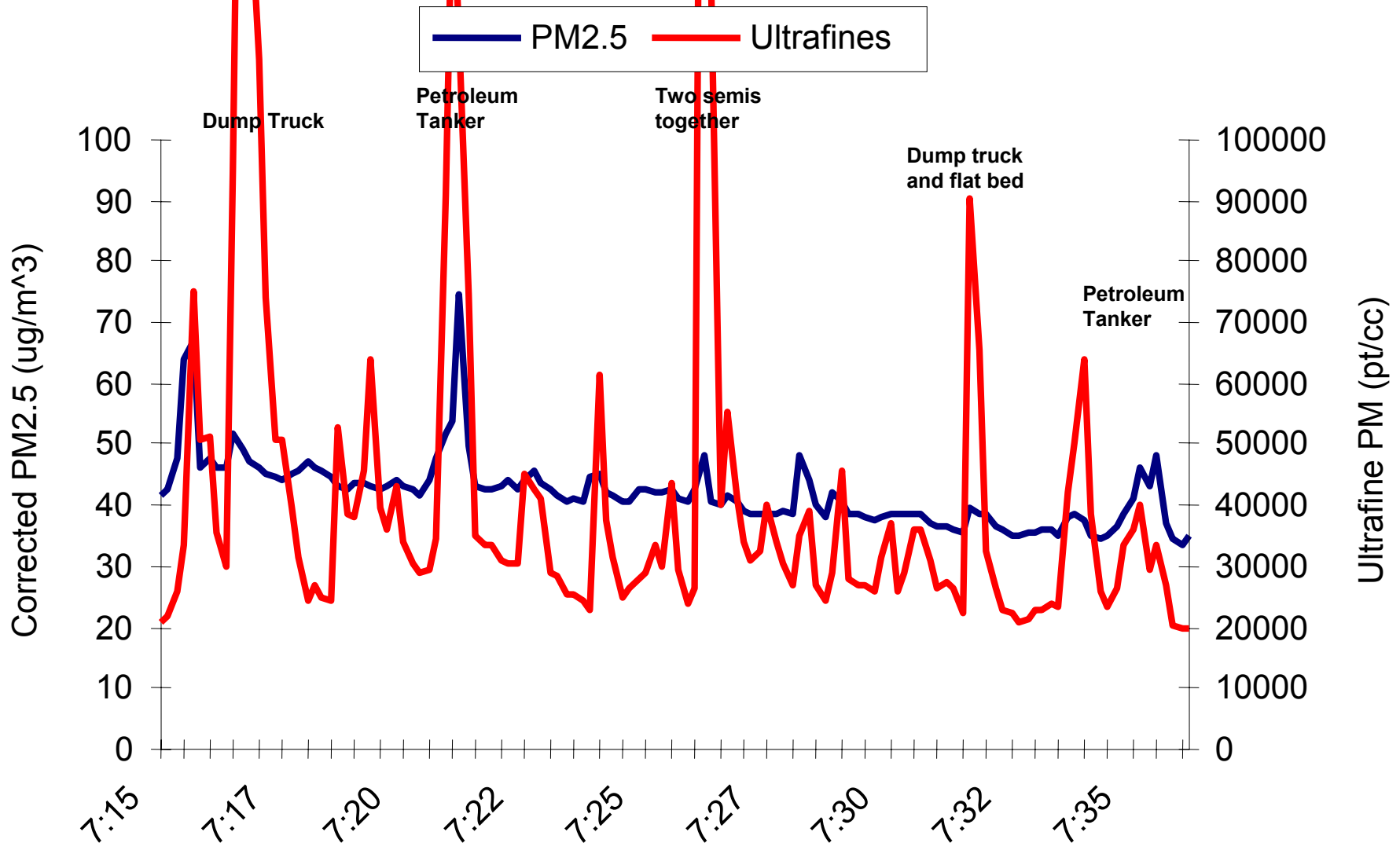


Allen's Ave-Onramp



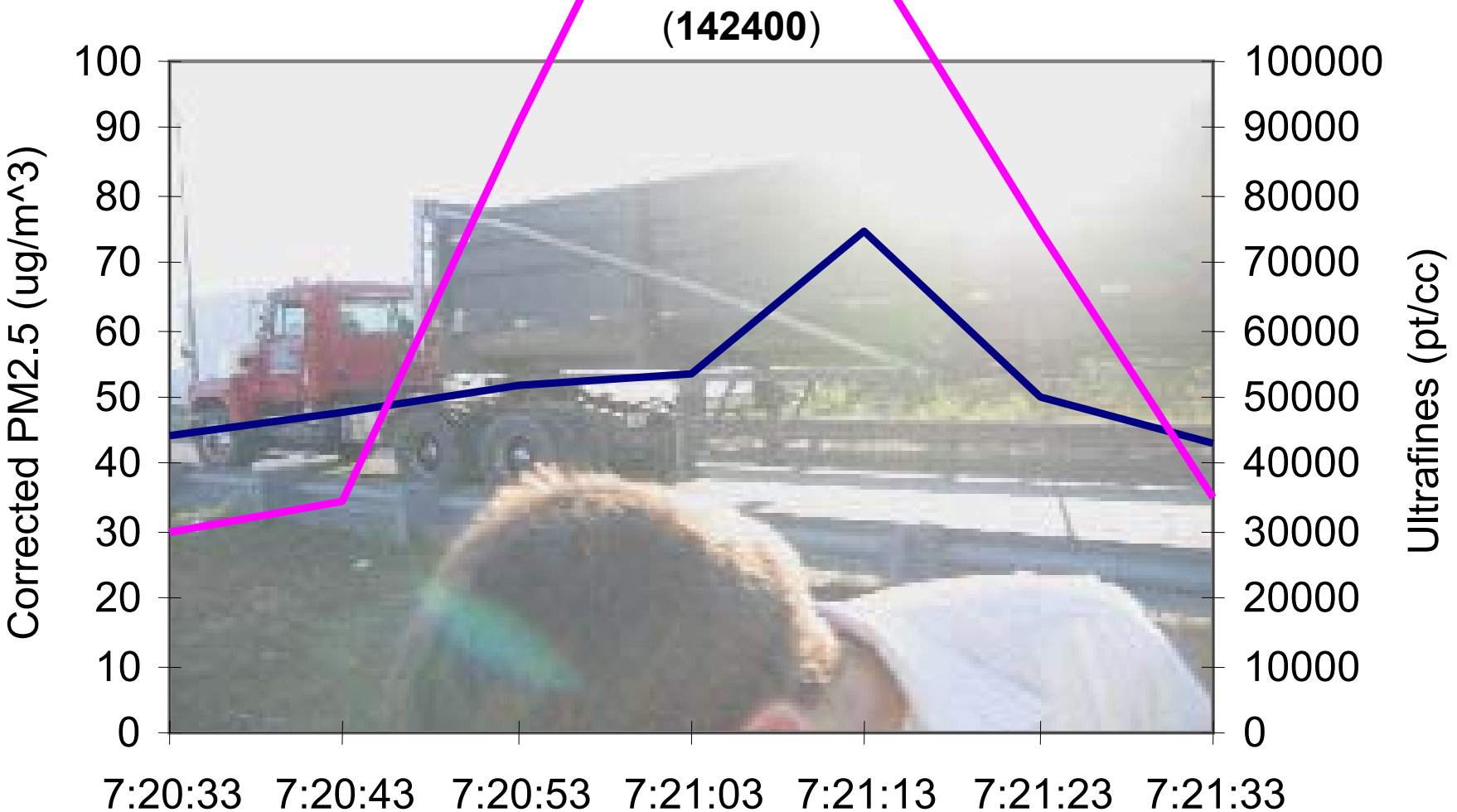
- Industrial diesels operating between Port of Providence and I-95
- Mostly tanker, dump, and delivery trucks
- Truck count: 35 trucks between 8:05 – 8:25, estimated 105 per hour
- Day 1: Hazy, breezy, 92 degrees F
- Day 2: Hazy, off-shore breeze, 94 degrees F
- Site approx. ½ mile from RI Hospital facilities, Roger Williams Middle School, Washington Park, Elmwood and Edgewood neighborhoods

I-95 Onramp at Allens Avenue



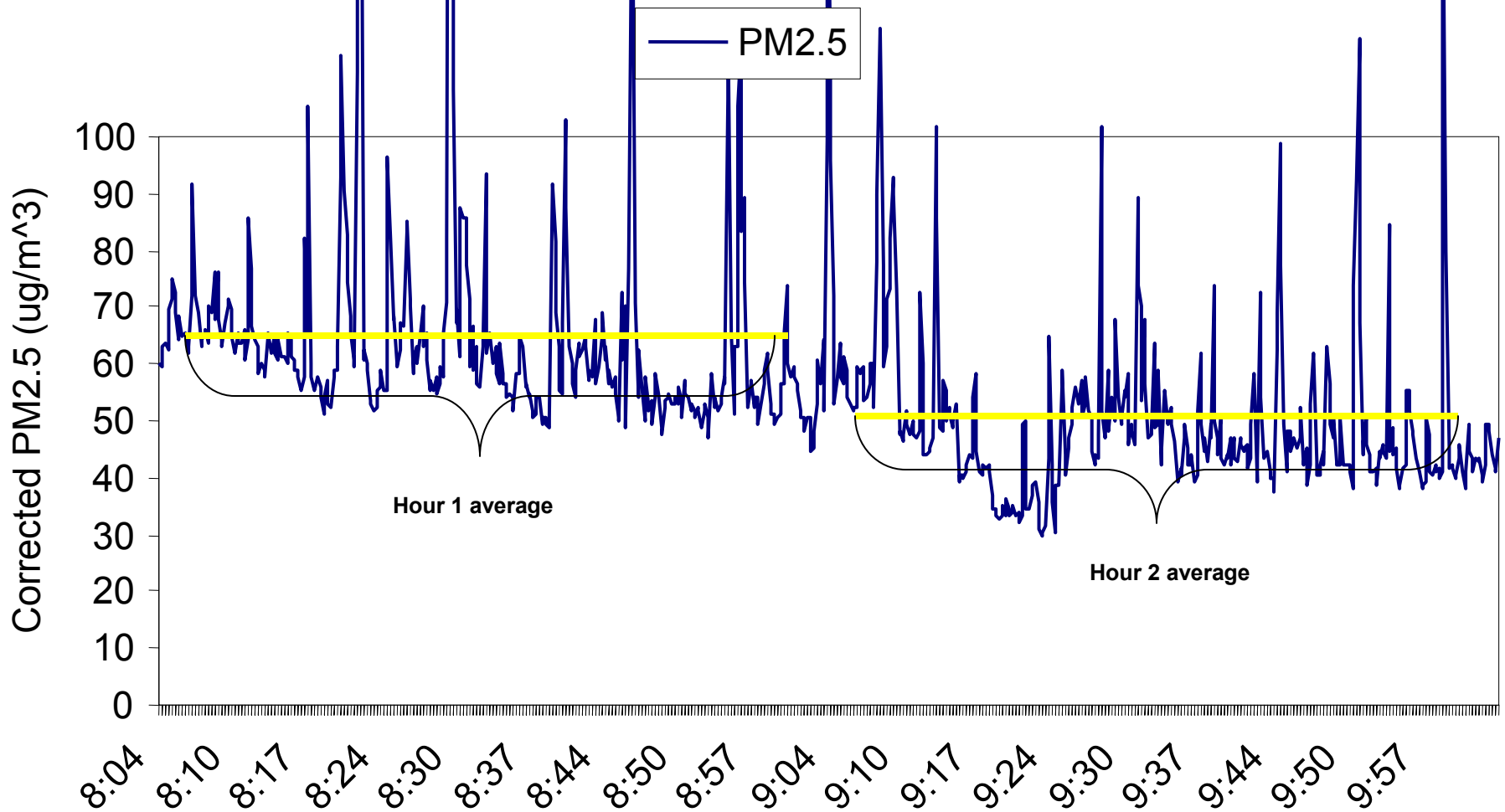
Truck Driving Up I-95 Onramp

— PM2.5 — Ultrafines

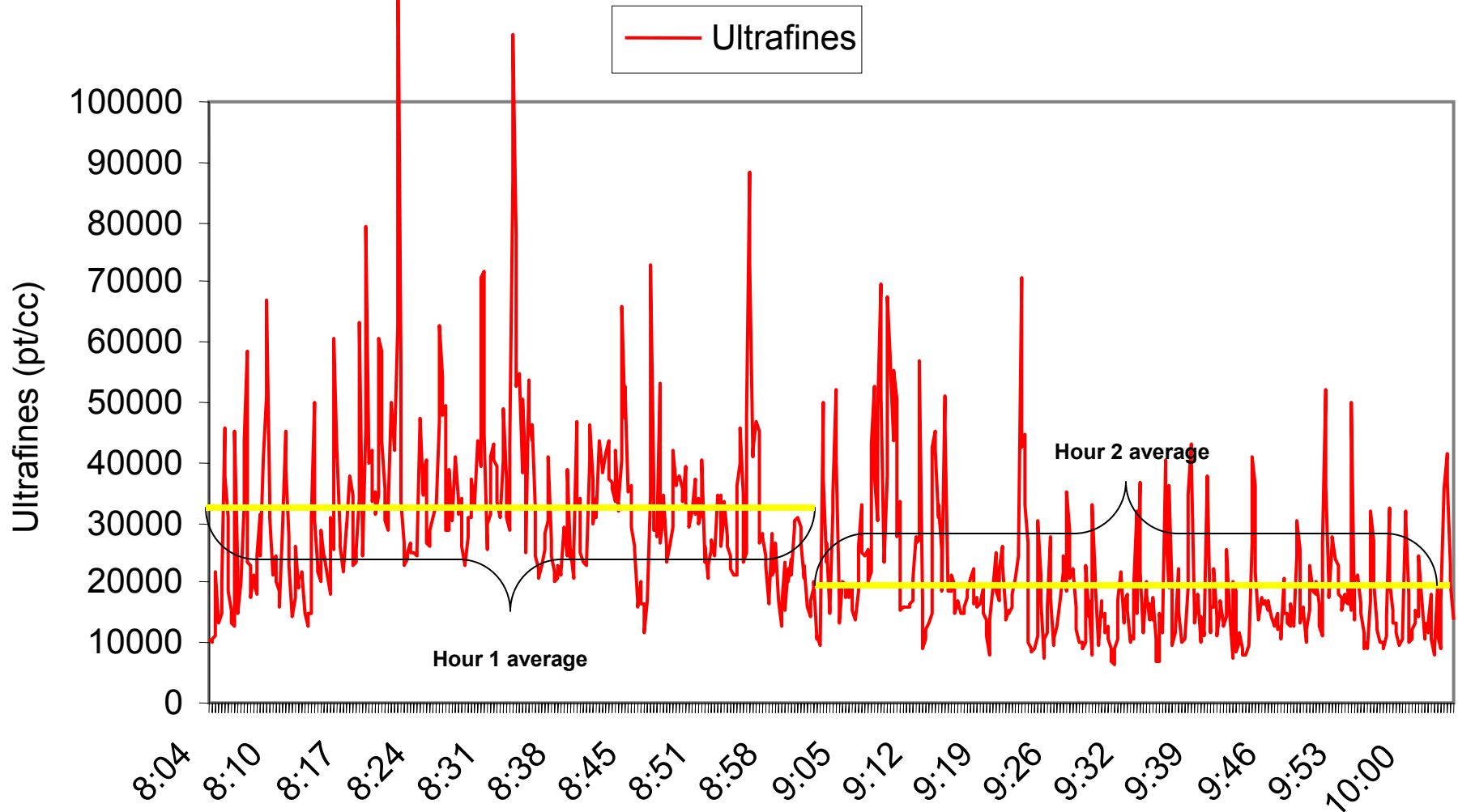


Allens Avenue & I-95, Day 1

Cumulative Effect – PM2.5 Offramp

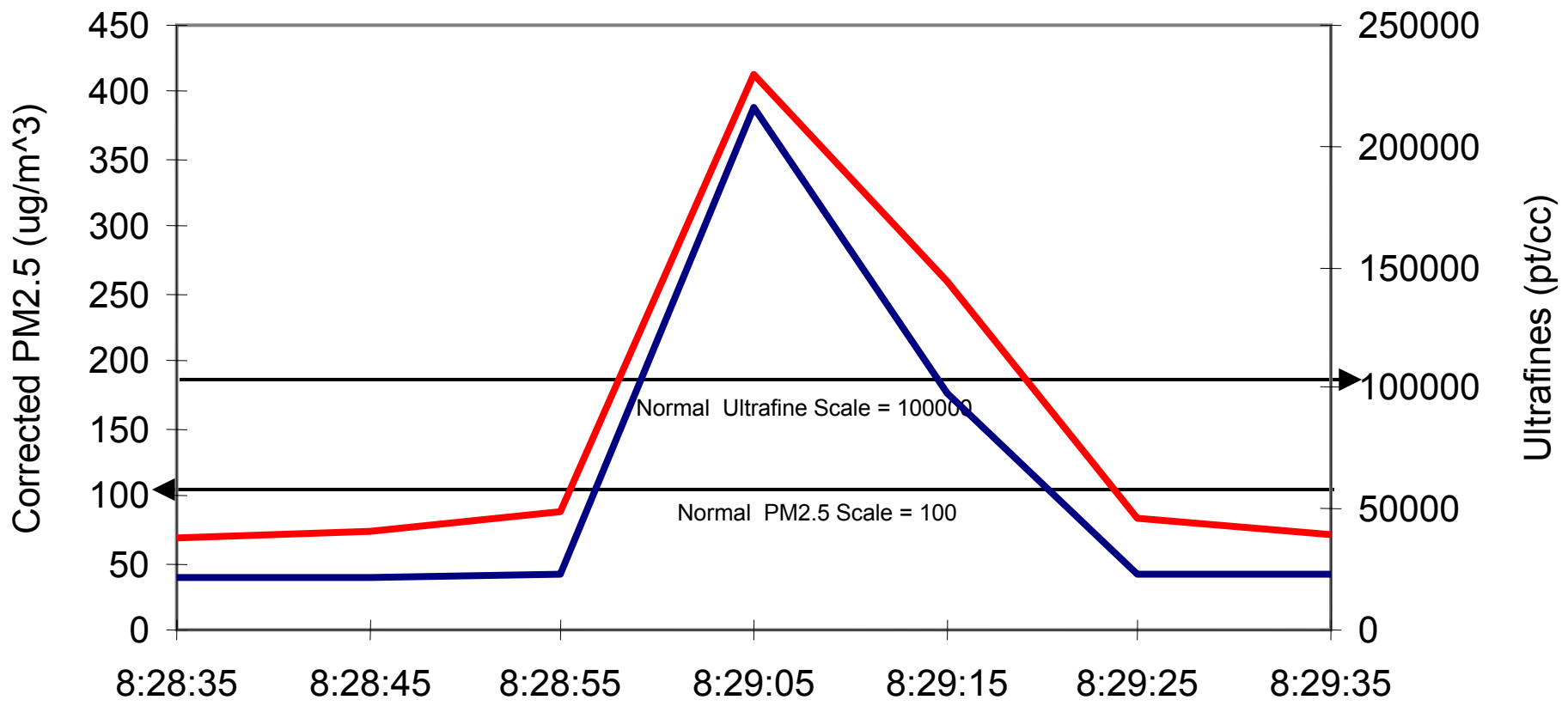


Cumulative Effect – Ultrafines Offramp



Two dump trucks arrive/depart at merge onto Allen's Avenue

— PM2.5 — Ultrafines



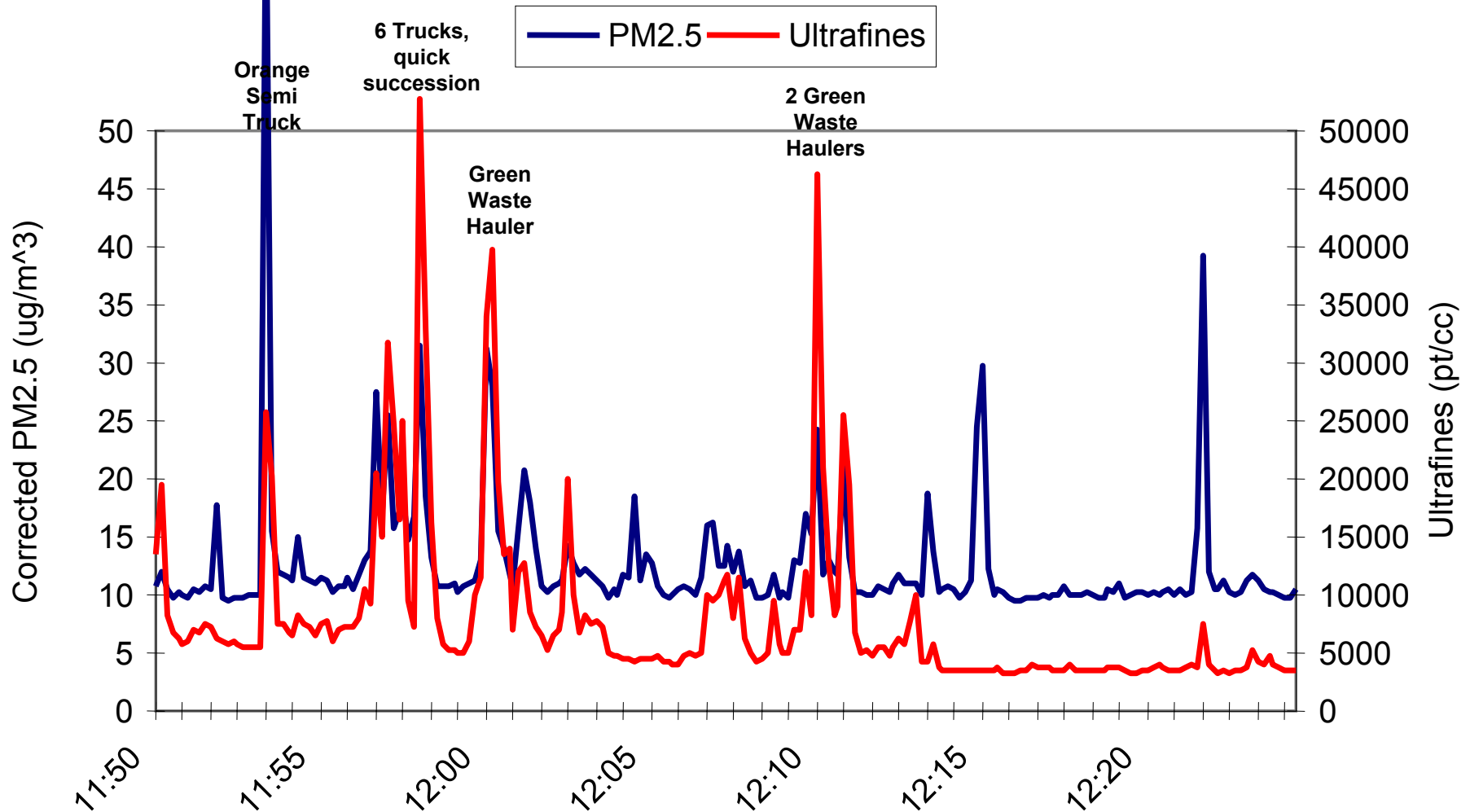
Allens Avenue & I-95, Day 1

Landfill - Description of Site



- Landfill access road, constant diesel traffic, Sierra Club estimates 1000 daily truck trips
- Trucks travel throughout the state and converge on Johnston at the landfill
- Truck count: 105 trucks between 11:50 – 12:20
- Very windy, quick dispersion of particulate matter
- Note: scale on graphs is reduced by half vs. Allens Ave

Diesel Traffic at the Landfill



Five Minute Detail – 6 Trucks





Findings, Recommendations and Next Steps



Summary Findings

- At each site, monitored fine particulate matter (PM_{2.5}) and ultrafine levels were observed to rise in response to passing diesel vehicles
- Diesel traffic contributes to cumulative concentrations of particulate matter in Providence

Diesels in Rhode Island

- You can find diesel engines everywhere because they are durable, efficient and reliable



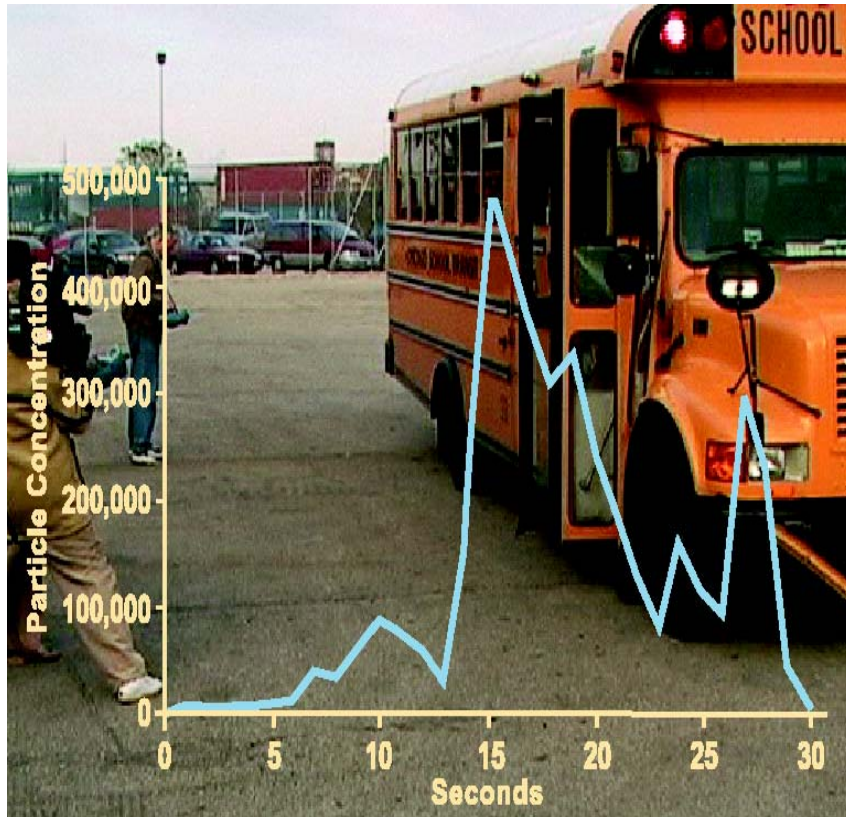
Diesels are here to stay, and they can be made cleaner

Recommendations

- Anti-idling – adopt state regulation and enforcement provision
- Clean fuels – ultra-low sulfur diesel (ULSD), biodiesel available
- Retire, replace, retrofit: reduce diesel soot up to 90%
- Enhance inspection & maintenance program – catch super-emitters
- Prioritize high-exposure fleets and high exposure communities for early attention

Effectiveness of Retrofit Technology

“Normal” School Bus



School Bus Retrofit with a DPF





Priority Fleets

- School buses
- Construction equipment
- Waste haulers
- Transit buses
- Marine & locomotives
- Other heavy trucks

Outreach

- Share results

- Constituencies

- Clean air advocates
 - Health care professionals
 - Affected neighborhoods
 - School system

- Policymakers

- Mayor, City councilors, State Legislators, Federal Delegation
 - RI Dept. of Environmental Management, RI Dept. of Transportation, RI Dept. of Health

- Opinion-makers and the Media





Reference Information

Equipment

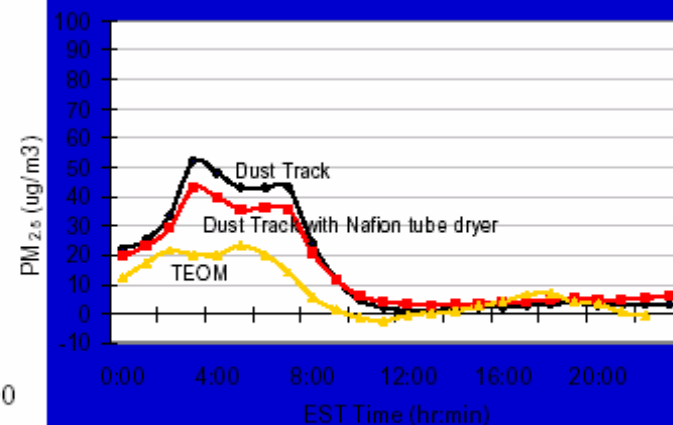
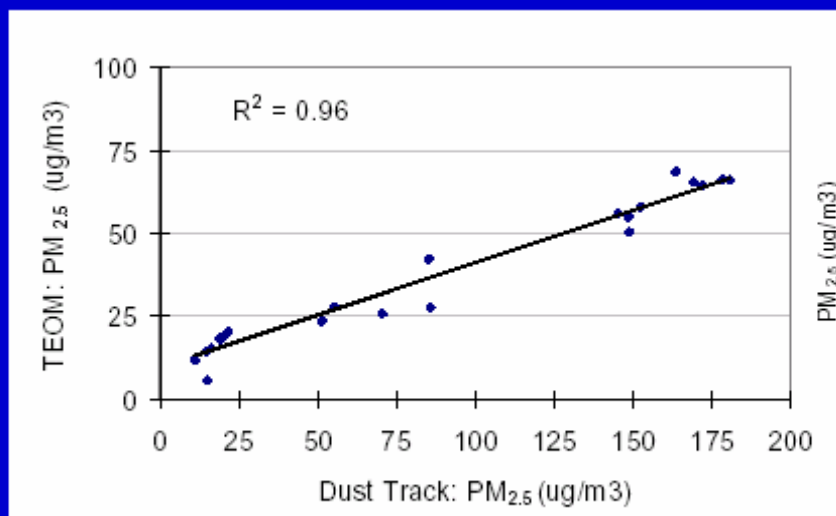
Instrumentation and technical support were provided by the Clean Air Task Force

- PM 2.5 Meter - DustTrak
 - measured **PM 2.5** mass
 - units: micrograms per cubic meter ($\mu\text{g}/\text{m}^3$)
 - NOT calibrated to DEP units
- Ultrafine Meter - PTrak
 - measures **ultrafine** particles ($<0.1 \mu\text{m}$ or microns)
 - Units: number of particles each second per cubic centimeter
- Black Carbon Aethelometer
 - marker for diesel PM
 - results not reported here
- Digital cameras



Calibration

Divide by 2.5 – All raw measurements of PM_{2.5} mass from the Dust Track were divided by 2.5 as an approximate calibration to DEM hourly monitoring data.
Rationale: CATF Dust Track-TEOM Calibration: ~ 2.5 slope



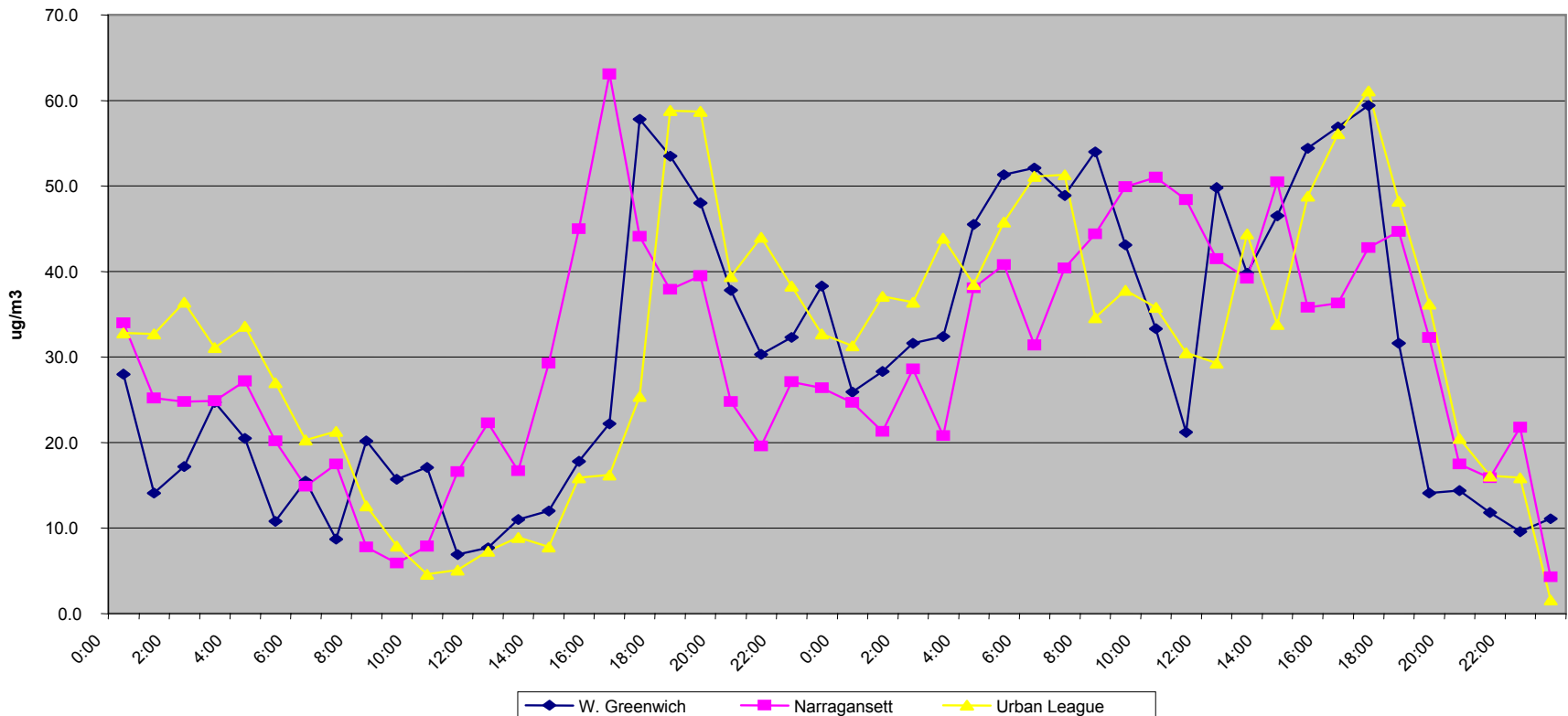
- All graphs in the RIDPI presentation of Providence monitoring reflect this calculation

Source: CATF rural NH calibration 2004; see <http://www.catf.us/publications/view/82>

Baseline Reference

PM2.5 Levels during 2 days of RIDPI project (Source: Barbara Morin, RI DEM)

PM2.5 at Rhode Island Sites - July 26-27, 2005





Contacts

Madeleine Weil, Environment Northeast, 203-495-8224, mweil@env-ne.org

Chris Wilhite, Clean Water Action, 401-331-6972, cwilhite@cleanwater.org

Matt Auten, Rhode Island PIRG, 401-421-6578, mauten@ripirg.org

Molly Clark, American Lung Assoc. of RI, 401-421-6487, ahandy@lungri.org

For more information, see <http://www.env-ne.org/Diesel%20Emissions.htm>