

An aerial photograph showing a massive fire with thick, dark black smoke billowing upwards and spreading across the sky. The smoke partially obscures the sun, which is visible on the left side of the frame, creating a bright, hazy glow. Below the smoke, a city or town is visible, with buildings and roads. The overall scene is dramatic and emphasizes the scale of the fire.

# Air Quality Monitoring at Structural Fires

NJDEP and EPA Region 2

RRT2 Meeting

April 2016

Hillsborough, NJ  
February 2016

# Why Monitor Air Quality?







Caribbean Air and Marine Branch



# Incidents that got us here

- World Trade Center
- Mecca Warehouse Fire
- Seaside Boardwalk Fire (Asbestos)
- Paulsboro Train Derailment

# NJ Warehouse Fires

- North Brunswick – July 22, 2015
  - Duration: 4 days
  - Building size approximately 650,000 square feet
  - Contained 8 businesses including automotive repair/supply business, floor coverings storage, home furnishings including plastic window coverings and housewares and a plastics injection molding company
  - Six apartment buildings evacuated
  - Evacuation and shelter in place orders issued
  - Roads closed
- Paterson Armory Fire – November 10, 2015
  - Duration: 6 hours
  - Building contents unknown
  - Nearby residents evacuated due to heavy smoke conditions
  - Shelter in place order issued
  - Area schools closed
- Veterans Industrial Park, Hillsborough – February 11, 2016
  - Duration: 2 days
  - Building contained a polystyrene pellet repackaging business
  - Area schools closed

# Veterans Industrial Park Fire Hillsborough, NJ



**Railcars with polystyrene pellets**

**Plume visible for miles and on  
Dopplar Radar**

# EPA Region 2 Air Monitoring/Sampling Resources for Structural Fires

- Particulate Monitors
  - Thermo Scientific DataRam 4 DR4
- Area Rae
  - CO, LEL, O2, VOC, HCN, Cl, H2S, CN, NH3, Gamma
- Multi Rae Pro
  - CO, LEL, O2, VOC, HCN, Cl, H2S, CN, NH3, Gamma
- SUMMA Canisters
  - EPA Method TO 15 (VOCs)
- Cassettes - Asbestos
- Sorbent Tubes – PCBs, Metals
- Contractor support through Removal Support Team (RST) Contract



# NJDEP Air Monitoring/Sampling Resources for Structural Fires

- Particulate Monitors (8 DustTrak II Aerosol Monitors)
- Area RAE ( 2 NJDEP & 16 CEHA)
  - CO, LEL, O2, VOC, HCN, Cl, H2S, CN, NH3, Gamma
- Pro RAE (16 NJDEP & 8 CEHA)
- Sorbent Tubes – PCBs, Metals, VOC, etc.
- Contractor support through NJ Emergency Response Services Contract
- Various handheld equipment to be sent down range for roving monitoring  
be appropriately dressed out personnel
- Statewide fixed site air monitoring network

# The last two slides

- What was listed in the prior slide are the resources that we know of to conduct downrange monitoring of smoke or any other particulate discharge (i.e. dust, asbestos, VOCs, etc. )in New Jersey today.
- A single warehouse fire tied up all the resources that NJDEP could bring to bear along with much of what EPA Region 2 has.
-

# Resources Available to Region 2



- **EPA Environmental Response Team (ERT)**
  - Additional Monitoring/Sampling Equipment
  - Trace Atmospheric Gas Analyzer (TAGA)
    - MS/MS which provides real-time monitoring for many organic and inorganic compounds at the ppbv levels or lower
    - GC/MS which analyzes volatile organic compounds at the ppbv level or lower
    - Agilent Micro GC, which assays permanent gases at ppmv levels
  - Data management support (VIPER)
    - wireless network based communications system designed to enable real time transmission of data from field sensors and provide data management, analysis, and visualization.
- **Interagency Modeling and Atmospheric Assessment Center (IMACC)**
  - Coordinates and disseminates Federal atmospheric dispersion modeling and hazard prediction product
  - Provides emergency responders with predictions of hazards associated with atmospheric releases to aid in the decision making process to protect the public and the environment



# IMAAC

**Interagency Modeling and  
Atmospheric Assessment Center**

## *Large Structure Fire Containing Polystyrene at a Warehouse Facility at Hillsborough Township, NJ*

**RFI – 0128U**

**12FEB2016**

**Requestor: EPA Region 2**

Distribution authorized to U.S. Government agencies and their contractors for administrative/operational use.

Date: 12/FEB/2016

Other requests for this document shall be referred to:

Defense Threat Reduction Agency

8725 John J. Kingman Rd, MS 6201

Fort Belvoir, VA 22060-6201

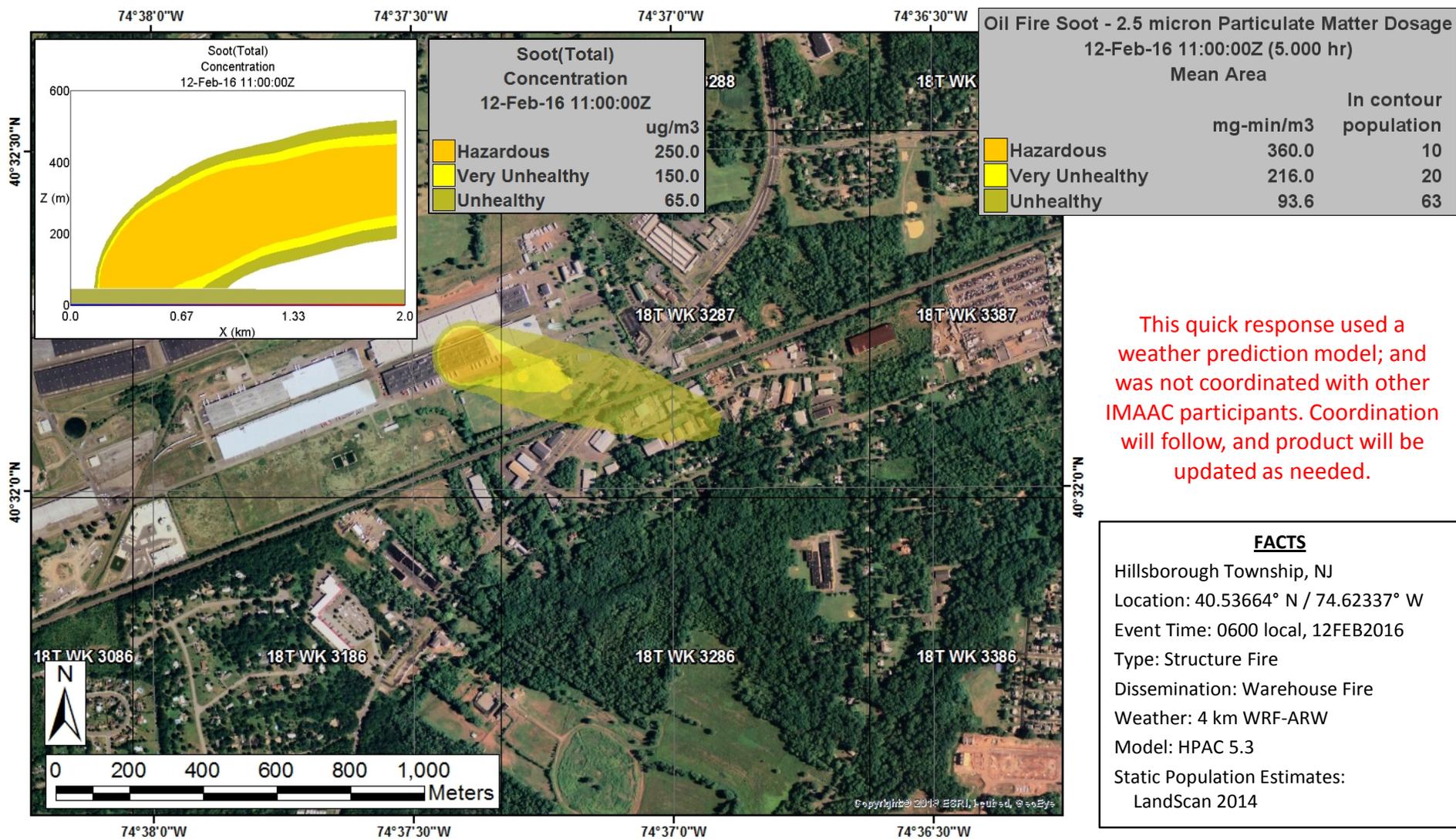


# Summary

- Known Information: Large structure fire at a warehouse facility at the Veterans Industrial Park which contains styrene pellets (Polystyrene) as well as ten rail cars containing the styrene pellets. Total of approximately 4 million pounds of the styrene pellets.
- Modeling Assumptions: This initial model presents a snap shot of the potential downwind hazard at 6:00 EST 12FEB2016.



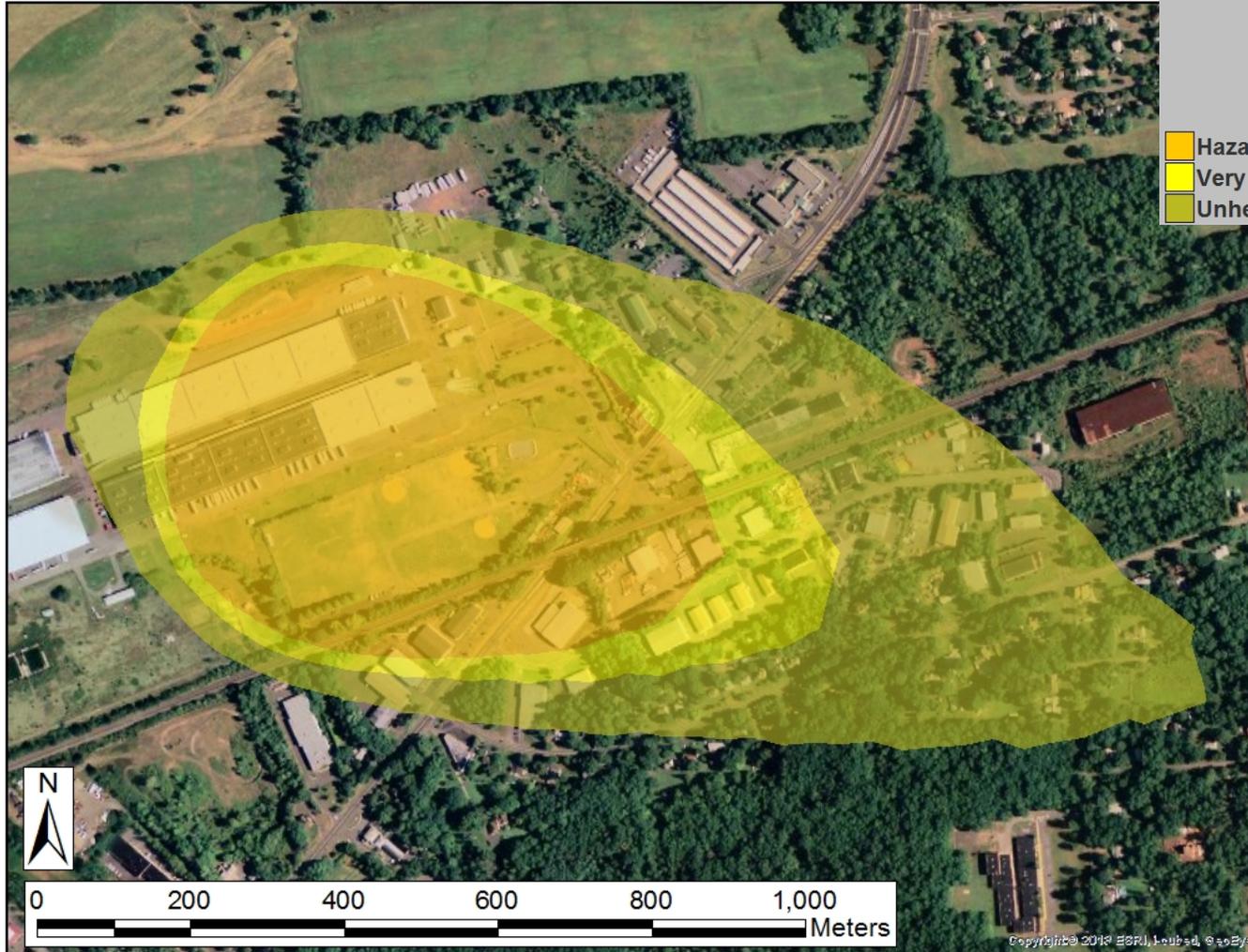
# Soot – Surface Dosage at 0600 local – Initial Response



This quick response used a weather prediction model; and was not coordinated with other IMAAC participants. Coordination will follow, and product will be updated as needed.



# Soot – Surface Dosage at 0900 local – Initial Response



Oil Fire Soot - 2.5 micron Particulate Matter Dosage  
12-Feb-16 14:00:00Z  
Mean Area

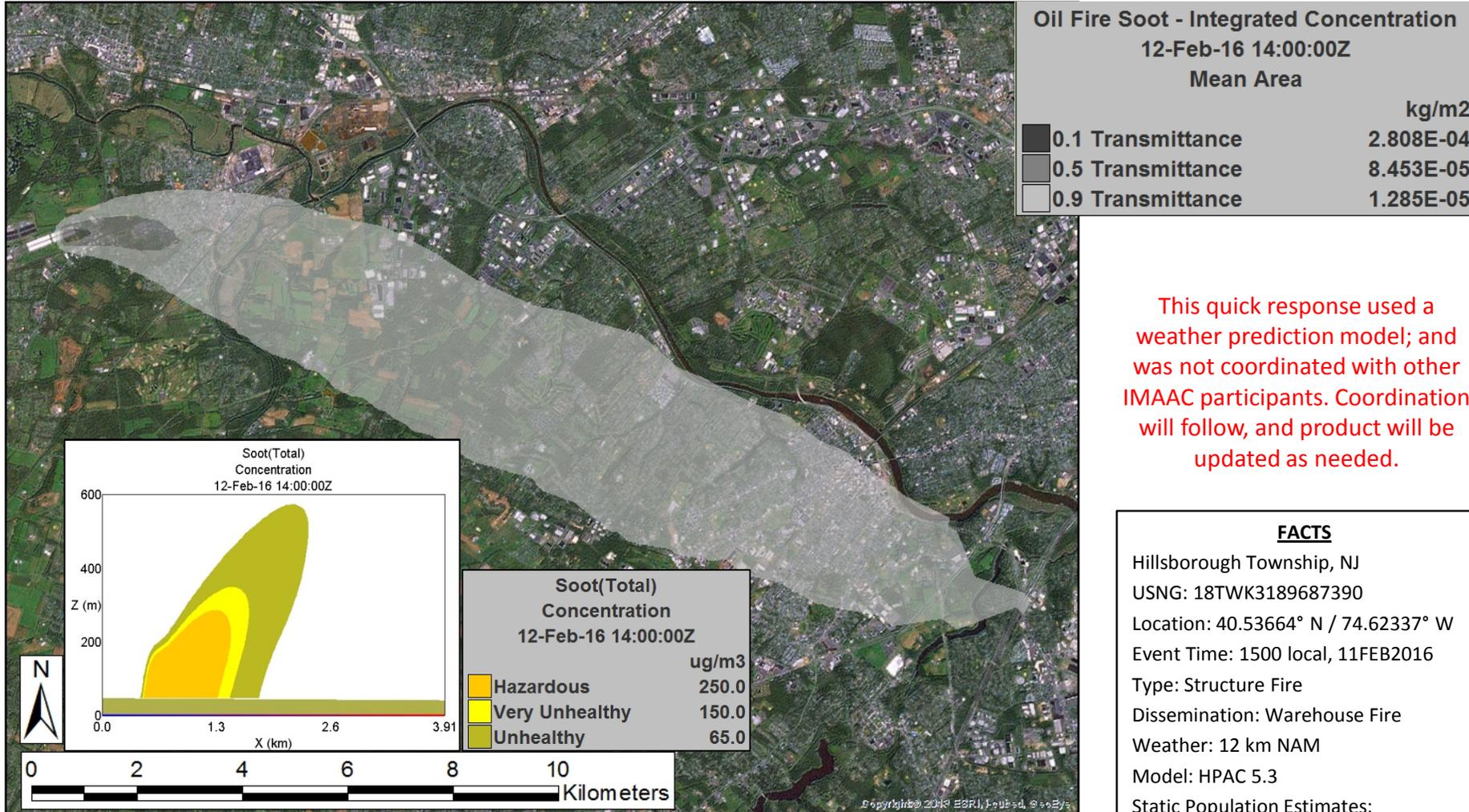
|  | mg-min/m3 | In contour population |
|--|-----------|-----------------------|
| <span style="color: yellow;">■</span> Hazardous          | 360.0     | 130                   |
| <span style="color: lightgreen;">■</span> Very Unhealthy | 216.0     | 170                   |
| <span style="color: darkgreen;">■</span> Unhealthy       | 93.6      | 278                   |

This quick response used a weather prediction model; and was not coordinated with other IMAAC participants. Coordination will follow, and product will be updated as needed.

| <b>FACTS</b>                                  |
|---|
| Hillsborough Township, NJ                     |
| USNG: 18TWK3189687390                         |
| Location: 40.53664° N / 74.62337° W           |
| Event Time: 1500 local, 11FEB2016             |
| Type: Structure Fire                          |
| Dissemination: Warehouse Fire                 |
| Weather: 12 km NAM                            |
| Model: HPAC 5.3                               |
| Static Population Estimates:<br>LandScan 2014 |



# Soot – Sky Obscuration at 0900 local – Initial Response



This quick response used a weather prediction model; and was not coordinated with other IMAAC participants. Coordination will follow, and product will be updated as needed.

# Soot – Concentration



| Value          | Description   |
|----------------|---|
| Hazardous      | Serious risk of (1) respiratory symptoms in children/adults, (2) aggravation of heart or lung disease, and (3) premature mortality in persons with cardiopulmonary disease and the elderly.         |
| Very Unhealthy | Significant increase of (1) respiratory symptoms in children/adults, (2) aggravation of heart or lung disease, and (3) premature mortality in persons with cardiopulmonary disease and the elderly. |
| Unhealthy      | Increased (1) respiratory symptoms in children/adults, (2) aggravation of heart or lung disease, and (3) premature mortality in persons with cardiopulmonary disease and the elderly.               |

Concentration values and descriptions taken from Pollutant-Specific Sub-indices and Health Effects Statements and Cautionary Statements for Guidance on the Air Quality Index tables, in *Guidelines for Reporting of Daily Air Quality – Air Quality Index (AQI)*, USEPA, EPA-454/B-06-001, May 2006.

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## [R02 Paterson Armory Fire Deployment](#)

All Times Eastern, DST Observed

Start: 11/10/2015

End:

Description:

## 2451-2: Patterson Fire Run 2

Start: 11/10/2015 4:34:41 PM

End:

Description: DR PM 2.5, AreaRAEs

Location:



[View Recent Data in Google Earth](#)

# VIPER Deployment Manager

- Integrates real time monitoring with location on monitors and real time weather
- Ability to graph readings for each monitor and each sensor

## Instruments and Latest Readings:

[\[Enable Instrument Connection Status Notifications\]](#)

### AreaRAE(s):

| ~ | Instrument ID                 | Connection | Location                | HCN     | VOC     | CO      | LEL   | GMMA    | H2S     | Received           |
|---|-------------------------------|------------|-------------------------|---------|---------|---------|-------|---------|---------|--------------------|
|   | <a href="#">(.46) AreaRAE</a> | OK         | 0.0000000, 0.0000000    | 0.1 ppm | 0.1 ppm | 0.0 ppm | 0.0 % | 2 uR/hr |         | 11/10/2015 5:39 PM |
|   | <a href="#">(.49) AreaRAE</a> | OK         | 40.9127770, -74.1582580 | 0.0 ppm | 0.0 ppm |         | 9.5 % | 6 uR/hr | 0.0 ppm | 11/10/2015 5:39 PM |
|   | <a href="#">(.51) AreaRAE</a> | OK         | 40.9115730, -74.1612130 | 0.0 ppm | 0.4 ppm |         | 0.0 % | 4 uR/hr | 0.0 ppm | 11/10/2015 5:39 PM |

### DataRAM 4000(s):

| ~ | Instrument ID                       | Connection | Location                | CONC       | TWA        | Temp   | RH   | Received           |
|---|-------------------------------------|------------|-------------------------|------------|------------|--------|------|--------------------|
|   | <a href="#">(.110) DataRAM 4000</a> | OK         | 40.9113850, -74.1612880 | 86.8 ug/m3 | 128 ug/m3  | 14 C   | 85 % | 11/10/2015 5:39 PM |
|   | <a href="#">(.185) DataRAM 4000</a> | OK         | 40.9137030, -74.1603470 | 9 ug/m3    | 6.4 ug/m3  | 17.9 C | 62 % | 11/10/2015 5:39 PM |
|   | <a href="#">(.69) DataRAM 4000</a>  | OK         | 40.9129270, -74.1580820 | 11.8 ug/m3 | 18.2 ug/m3 | 13.1 C | 82 % | 11/10/2015 5:39 PM |

# Air Quality Standards

- **Acute Exposure Guideline Levels (AEGs)**

- describe the human health effects from once-in-a-lifetime, or rare, exposure to airborne chemicals
- Used by emergency responders when dealing with chemical spills or other catastrophic exposures, AEGs are set through a collaborative effort of the public and private sectors worldwide
- calculated for five relatively short exposure periods
  - 10 minutes
  - 30 minutes
  - 1 hour
  - 4 hours
  - 8 hours

- **EPA National Ambient Air Quality Standards for Particle Pollution (NAAQS)**

- EPA required to set national air quality standards for particulate matter under the Clean Air Act (CAA)

# AQI Index for Particulate Matter

| AQI Category                          | Index Values | Breakpoints<br>( $\mu\text{g}/\text{m}^3$ , 24-hour average) |
|---------------------------------------|--------------|--|
| <b>Good</b>                           | 0 - 50       | 0.0 – 12.0   |
| <b>Moderate</b>                       | 51 - 100     | 12.1 – 35.4  |
| <b>Unhealthy for Sensitive Groups</b> | 101 – 150    | 35.5 – 55.4  |
| <b>Unhealthy</b>                      | 151 – 200    | 55.5 – 150.4   |
| <b>Very Unhealthy</b>                 | 201 – 300    | 150.5 – 250.4  |
| <b>Hazardous</b>                      | 301 – 400    | 250.5 – 350.4  |
|                                       | 401 – 500    | 350.5 – 500  |