

# Midwest Transportation Air Quality Summit



## Measurements During Dan Ryan Reconstruction

**October 27–29, 2009**



# Project Background

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- The Illinois Department of Transportation (IDOT) began the \$975 million reconstruction in the summer of 2004.
- It was the first Illinois construction project with extensive environmental monitoring.
- Environmental Design International inc. (EDI) was contracted to develop and implement air monitoring programs before and during reconstruction activities (also developed and implemented noise and vibration programs).
- EDI identified and monitored “sensitive receptors” along the reconstruction zone.
- The Dan Ryan Reconstruction Project became one of the largest, **green** construction projects in the nation.



# Purpose for Air Monitoring

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- To maintain the overall air quality in the surrounding community;
- To prevent the occurrence of construction-related illness;
- To maintain the air quality at sensitive community locations;
- To report the condition of the air quality to the surrounding community;
- To assist in the development of environmentally-friendly work practices;
- To gather useful information for future construction projects; and
- To protect the surrounding community from overexposure to construction-related dust.



# Project Timeline

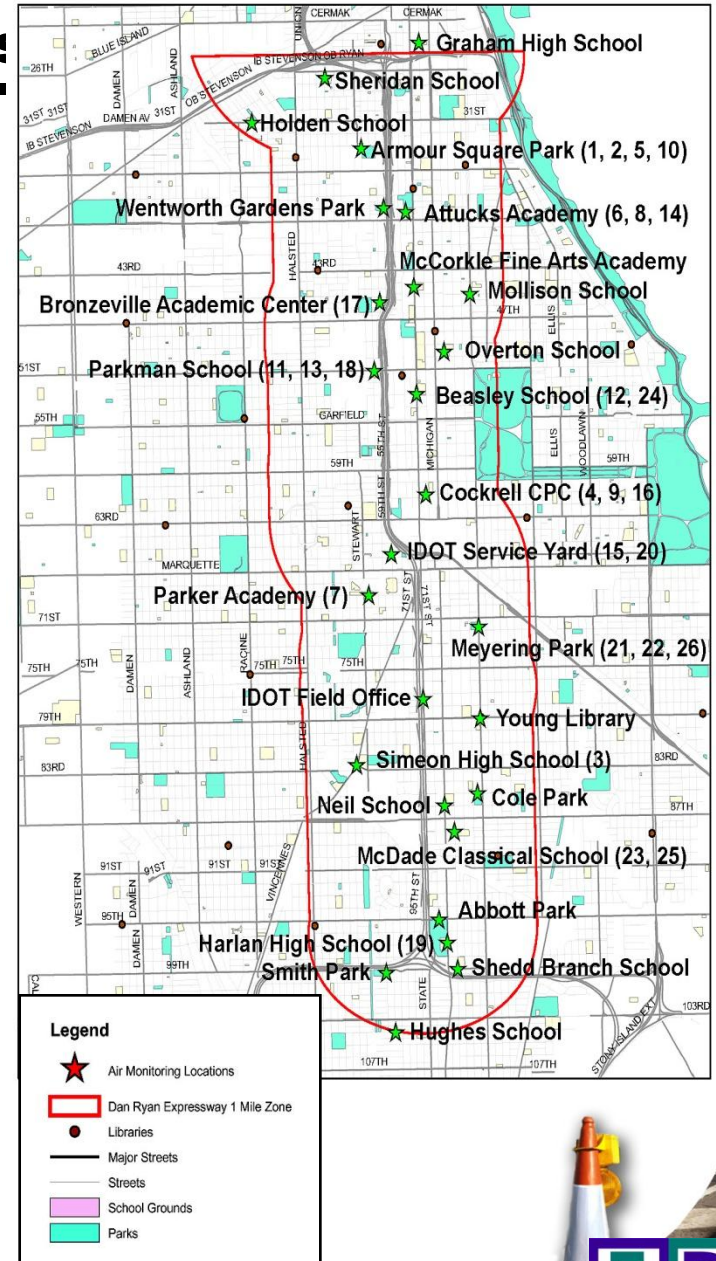
- **June 2004**  
Developed sample parameters and action levels
- **July 2004 to August 2004**  
Identified and established sensitive receptor locations
- **September 2004 to December 2004**  
Performed baseline air monitoring and reporting
- **January 2005 to October 2008**  
Performed reconstruction air monitoring and reporting.



*Throughout the duration of the project, EDI submitted quarterly monitoring reports documenting the air monitoring results within the Dan Ryan reconstruction zone that compared results to baseline conditions and action levels.*

# Identifying Sensitive Receptors

- EDI identified 27 sensitive receptors based on demographics and duration of occupancy.
- Receptors included: schools, parks, daycare centers, nursing homes, places of worship, etc.
- Officials at each location approved the installation of sampling and monitoring equipment on their premises.
- Locations were chosen allowing an optimal monitoring radius.



# Air Sampling Parameters

- Total nuisance dust
- Respirable silica
- Particulate matter (PM<sub>10μ</sub> and PM<sub>2.5μ</sub>)
- Lead
- Asbestos
- Diesel components as PAHs



# Air Monitoring Equipment

- **Battery-powered low volume pumps** - drew air through a filter cassette. This device was easily transportable and was able to be placed at sensitive receptors nearest heavy construction.
- **Partisol-Plus Model 2025 Sequential Samplers** - monitored for gravimetric PM<sub>10</sub> and PM<sub>2.5</sub> (with sharp cut cyclone) on a 47 mm 2.0 micron teflon filter. This sampler required a power source for operation but was easily transportable and was able to be placed at sensitive receptors (with a power source) nearest heavy construction.
- **TEOM Series 1400a Ambient Particulate Monitors** - collected real-time data. This sampler required hard wire electrical service and was not able to be placed at different locations along the Dan Ryan Expressway.



# Air Monitoring

- EDI performed baseline air monitoring along both sides of the Dan Ryan Expressway reconstruction zone and affected arterial roads.
- Sites were monitored for weather conditions, unrelated construction activities, and proximity to diesel emission sources.
- Following the baseline air monitoring, air monitoring continued throughout the reconstruction at the same sites, using the same sample parameters.
- Real-time monitoring for particulate matter took place at two locations in the central portion of the Dan Ryan.



# Project Action Levels

Project Action Levels			
Parameter	Concentration	Basis	
Total dust	335 $\mu\text{g}/\text{m}^3$	IDPH/IEPA	
Respirable silica	10 $\mu\text{g}/\text{m}^3$	IDPH/IEPA	
Lead	2.0 $\mu\text{g}/\text{m}^3$ /1.5 $\mu\text{g}/\text{m}^3$	24-hour maximum/quarterly average	USEPA/NAAQS
Asbestos (09/04 to 03/06)	0.01 fiber/cm <sup>3</sup>	clearance value	IDPH/USEPA
PAHs (09/04 to 03/06)	1.0 $\mu\text{g}/\text{m}^3$	24-hour	Chicago Background
PAHs (03/06 to 10/07)	248.0 $\mu\text{g}/\text{m}^3$	24-hour	IDPH/IEPA
PM <sub>10</sub> $\mu$	150 $\mu\text{g}/\text{m}^3$ /120 $\mu\text{g}/\text{m}^3$	24-hour	NAAQS/80% of NAAQS
PM <sub>2.5</sub> $\mu$	65 $\mu\text{g}/\text{m}^3$ /52 $\mu\text{g}/\text{m}^3$	24-hour	NAAQS/80% of NAAQS
PM <sub>2.5</sub> $\mu$ *	35 $\mu\text{g}/\text{m}^3$ *	24-hour*	NAAQS*
Notes: IDPH = Illinois Department of Public Health		USEPA - United States Environmental Protection Agency	
IEPA = Illinois Environmental Protection Agency		NAAQS = National Ambient Air Quality Standards	
*Effective December 18, 2006, the EPA changed the PM <sub>2.5</sub> $\mu$ NAAQS 24-hour standard from 65 $\mu\text{g}/\text{m}^3$ to 35 $\mu\text{g}/\text{m}^3$ . There are two PM <sub>2.5</sub> $\mu$ NAAQS, a 35 $\mu\text{g}/\text{m}^3$ daily average and a 15 $\mu\text{g}/\text{m}^3$ annual average. The daily average NAAQS is computed from the fourth high daily value measured during the calendar year and the annual average is the arithmetic average of all samples collected during the year.			

# Mitigation Efforts

- **Construction dust** was controlled by watering, street sweeping, and the application of dust suppressants
- **Diesel emissions** were reduced with emission-control devices on construction equipment and cleaner fuels (ultra-low sulfur diesel). Restrictions were placed on how long diesel equipment could idle.



# Community Involvement

- Monitoring stations were moved in consultation with IDOT staff to resolve any community concerns.
- EDI provided technical support for several community meetings.
- Community input was actively incorporated into the monitoring strategies.
- Local elected officials were continually engaged to keep them informed on the project's status.



# Air Monitoring Results

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- **Baseline**

Analytical results remained below project action levels set for total dust, respirable silica, lead, asbestos, PM10 $\mu$ , and PM2.5 $\mu$ . Diesel components were detected above the project action levels three times

- **2005**

Analytical results remained below project action levels set for asbestos and PM10 $\mu$ . Total dust was detected above the project action level once, respirable silica was detected above the project action level 14 times, lead was detected above the project action level once, diesel components were detected above the project action level three times, gravimetric PM2.5 $\mu$  was detected above the project action level once, and real-time PM2.5 $\mu$  was detected above the project action level 4 times.



# Air Monitoring Results (continued)

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- **2006**

Analytical results remained below project action levels set for asbestos, diesel components, gravimetric PM<sub>10μ</sub>, and real-time PM<sub>10μ</sub>/PM<sub>2.5μ</sub>. Total dust was detected above the project action level once, respirable silica was detected above the project action level 7 times, lead was detected above the project action level once, and gravimetric PM<sub>2.5μ</sub> was detected above the project action level once.

- **2007**

Analytical results remained below project action levels set for total dust, lead, asbestos, diesel components, gravimetric PM<sub>10μ</sub>, and real-time PM<sub>10μ</sub>. Respirable silica was detected above the project action level 3 times, gravimetric PM<sub>2.5μ</sub> was detected above the project action level 8 times, and real-time PM<sub>2.5μ</sub> was detected above the project action level 10 times.



# Air Pollution Action Days/PM<sub>2.5</sub> $\mu$ Unhealthy Days

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- **2005**

Four days were recorded where PM<sub>2.5</sub> $\mu$  levels were elevated. Of these four days, three were also EPA Air Pollution Action Days and one was an EPA PM<sub>2.5</sub> $\mu$  “Unhealthy Day”.

- **2006**

One day was recorded where PM<sub>2.5</sub> $\mu$  levels were elevated. The PM<sub>2.5</sub> $\mu$  result was inconsistent with EPA PM<sub>2.5</sub> $\mu$  sample results (similar location and sampling period). The field sampling techniques and laboratory quality control/assurance (QA/QC) procedures were reviewed. No unusual observations were noted. An isolated local emission event may have been the cause of the inconsistent result.



# Air Pollution Action Days/PM<sub>2.5</sub> $\mu$ Unhealthy Days (con't)

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- 2007

Fourteen days were recorded where PM<sub>2.5</sub> $\mu$  levels were elevated. Of these 14 days, three were also EPA Air Pollution Action Days and seven were EPA PM<sub>2.5</sub> $\mu$  “Unhealthy Days”. The remaining four elevated readings were likely a regional affect due to weather conditions.

# Conclusions

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- The elevated air readings can not be directly related to the Dan Ryan reconstruction activities.
- Elevated readings appear to be related to the overall air quality in the Chicago Metropolitan area.



# Thank you!

