

Minnesota Air, Water, and Waste Environmental Conf.

Air Modeling – Training (8am-noon)
Sheraton Bloomington Hotel, Atrium 7

February 14, 2006
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Air Modeling (98 Slides)

- AERMOD Status and MPCA “Draft” Data
- AERMOD Urban Modeling Developments
 - Metropolitan Statistical Areas and Micropolitan Statistical Areas
- New MPCA NAAQS/MAAQs Feature: FAR Data
- Break - slide 40
- Rochester and Olmsted County SIP Work
 - RPU-Silver Lake Plant Sensitivity Analyses
- Break - slide 75
- AERA/RASS with supplemental Post-RASS Option
- Fugitive PM₁₀ emissions: roads, cooling towers, etc.
- VISCREEN (Nearby areas v. Class I areas)
- Future Possibilities

Fugitive PM10 Emissions

- Paved Roads
- Unpaved Roads
- Cooling Towers

Paved Roads

- EPA AP42 and EPA Mobile 6.2
- MPCA Dual Adjustment (Optional)
 - Includes speed adjustment: $(S/30)^{0.5}$
 - S = Speed in MPH
 - Similar to unpaved road speed adjustment
 - Includes Mobile 6.2 tailpipe emissions
 - Onsite traffic (cars, trucks, etc.)
 - Idling HDDV (heavy duty diesel vehicles)
 - Generally small compared to re-entrainment
- Dispersion based on Gilles et. Al.
 - Atmospheric Environment (2005), p.2341-2347

Unpaved Roads

- EPA AP42 Guidance
- MPCA Guidance (same as EPA?)
- Same dispersion as paved roads
 - Atmos. Environment (2005), p.2341-2347

Road Dispersion - Volume Sources

■ Volume Source Parameters (Rochester roads)

- $TOP = 1.7 * \text{Vehicle Height}$
- $\text{Release Height} = TOP / 2.0$
- $\text{Initial Sigma-Z} = TOP / 2.15$
- $\text{Initial Sigma-Y} = \text{Spacing} / 2.15$
 - Rochester Examples:
 - Spacing ~10m for roads with 1 lane each way
 - Spacing ~20m for roads with 2 lanes each way
 - Spacing ~25m for roads with 3 lanes each way

■ Reference: Gilles et. al.

- Atmospheric Environment (2005), p. 2341-2347

AP42 Silt Loading (grams/m²)

Section 13.2.1 – Paved Roads

■ AP42 Range for "Public" Roads (Table 13.2.1-3)

■ Non-winter Conditions

- 0.6 for ADT < 500
- 0.2 for ADT 500-5000
- 0.06 for ADT 5000-10000
- 0.03 for ADT > 10000

■ Winter Conditions

- 2.4 for ADT < 500
- 0.6 for ADT 500-5000
- 0.12 for ADT 5000-10000
- 0.03 for ADT > 10000

AP42 Silt Loading (grams/m²)

Section 13.2.1 – Paved Roads

■ AP42 Range for Industrial Facilities

- Table 13.2.1-4
- Mean Silt Loading: 7.4-292 g/m²
- Range of Values: 0.09-400 g/m²
- MPCA Title V Default: 10.0 g/m²

■ Most Common Errors

- Assuming “public roads” for “industrial facilities”
- Assuming 0.015 g/m² for “limited access” roads
 - Baseline value for public, limited access roads with > 10,000 ADT (i.e., freeways)

Measured Silt Loading Values

- Measured Values in Minnesota (Summer)
 - OSB Manufacturers (Ainsworth [formerly Potlatch] – Grand Rapids, Bemidji): $GR=0.39$, $B=1.19 \text{ g/m}^2$
 - Similar facilities
 - Both use natural gas and wood
 - Silt loadings differ by factor of 3
 - Cereal Production (N. Gas) (Malt-O-Meal - Northfield): 0.5 g/m^2
 - Soybean Processing (N. Gas, Diesel) (Minnesota Soybean Processors - Brewster): 0.11 g/m^2
 - Coal-Fired Public Utility (Virginia Public Utilities): 0.67 to 9.3 g/m^2

Measured Silt Loading Values at Selected Ethanol Facilities

- Measured Values at Ethanol Plants (Summer)
 - Chippewa Valley-Benson (N. Gas): 0.37, 0.6 g/m²
 - ADM-Marshall (2001): 0.76 to 2.93 g/m² (no cleaning)
 - ADM-Marshall (2003): 0.70 to 0.72 g/m² (w/ cleaning)
 - Two coal-fired boilers; truck & rail delivery of grain, coal, etc.
 - Silt loading approach and exposure profiling method
 - Daily road cleaning (sweeping, vacuuming, and washing)
 - Onsite speed limit of 5 MPH
 - South Coast Air Quality Management District (SCAQMD) Rule 1186 Certified (80% control) – see next slide
- Companies should expect “some” testing

SCAQMD Rule 1186 Certified

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Crosswind® J Wheel Recirculating Air Sweeper



Elgin's Crosswind J regenerative air sweeper gives contractors, municipalities and industries a powerful sweeper with unequalled versatility, flexibility and productivity. The Crosswind J recirculating vacuum sweeper efficiently cleans large flat paved areas such as streets, parking lots, and airport runways. Contractors and public works officials alike appreciate the Crosswind because it is easy to operate and simple to maintain.

The Crosswind ergonomic design allows the operator to sweep in a safe, comfortable manner. Mounted on the short-wheelbase chassis of either conventional or cab-over chassis, the Crosswind is operated by simple rocker switches and comes with a complete set of gauges.

A combination of large hopper and water tank, plus excellent fuel efficiency, allow the sweeper a long work period between trips to dumping, re-watering and fueling sites.

 A **PM₁₀** certified sweeper, the Crosswind J recirculates the air used to carry the debris into the hopper, rather than venting it into the air, returning minimum dust into the environment.

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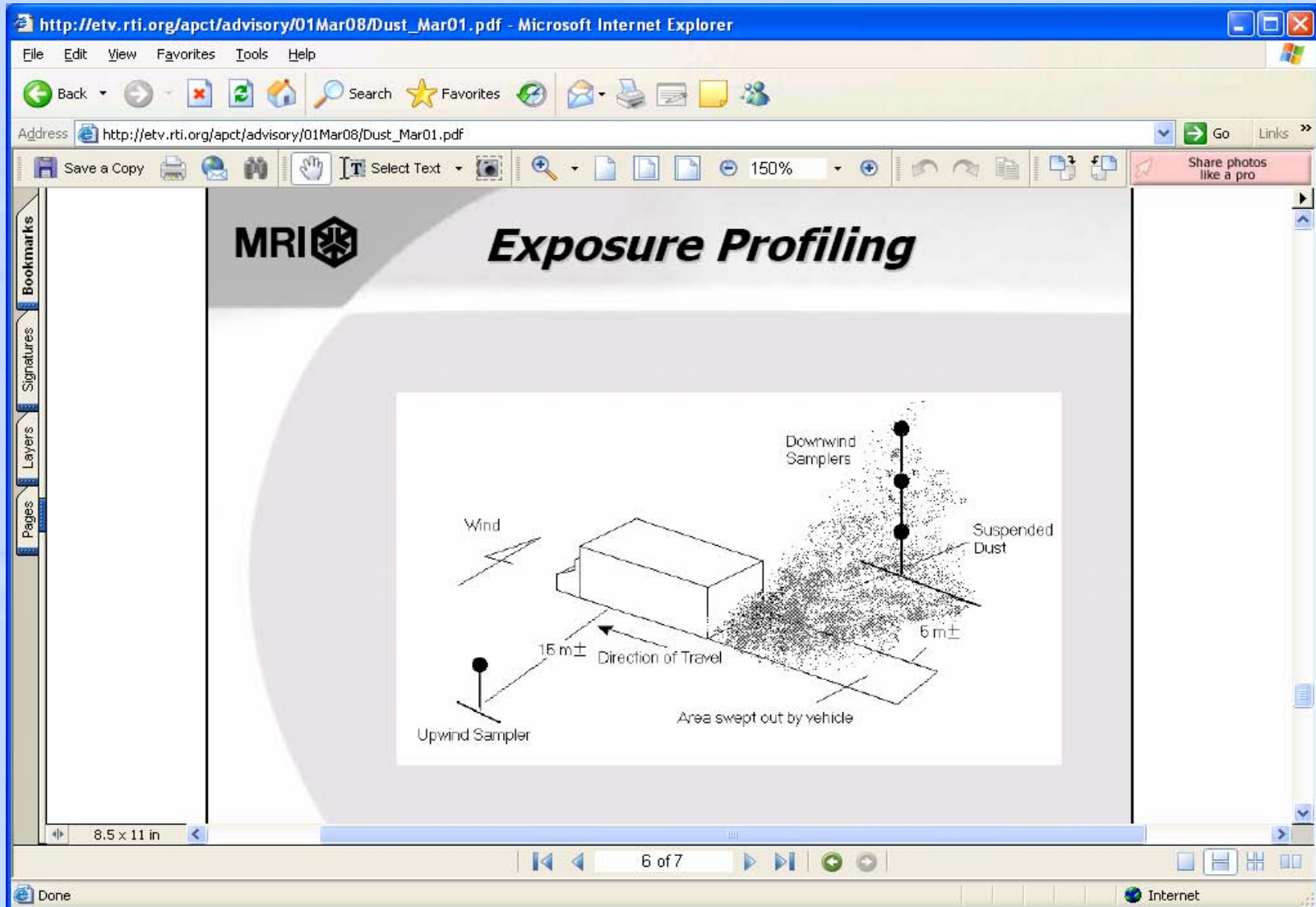
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Specifications

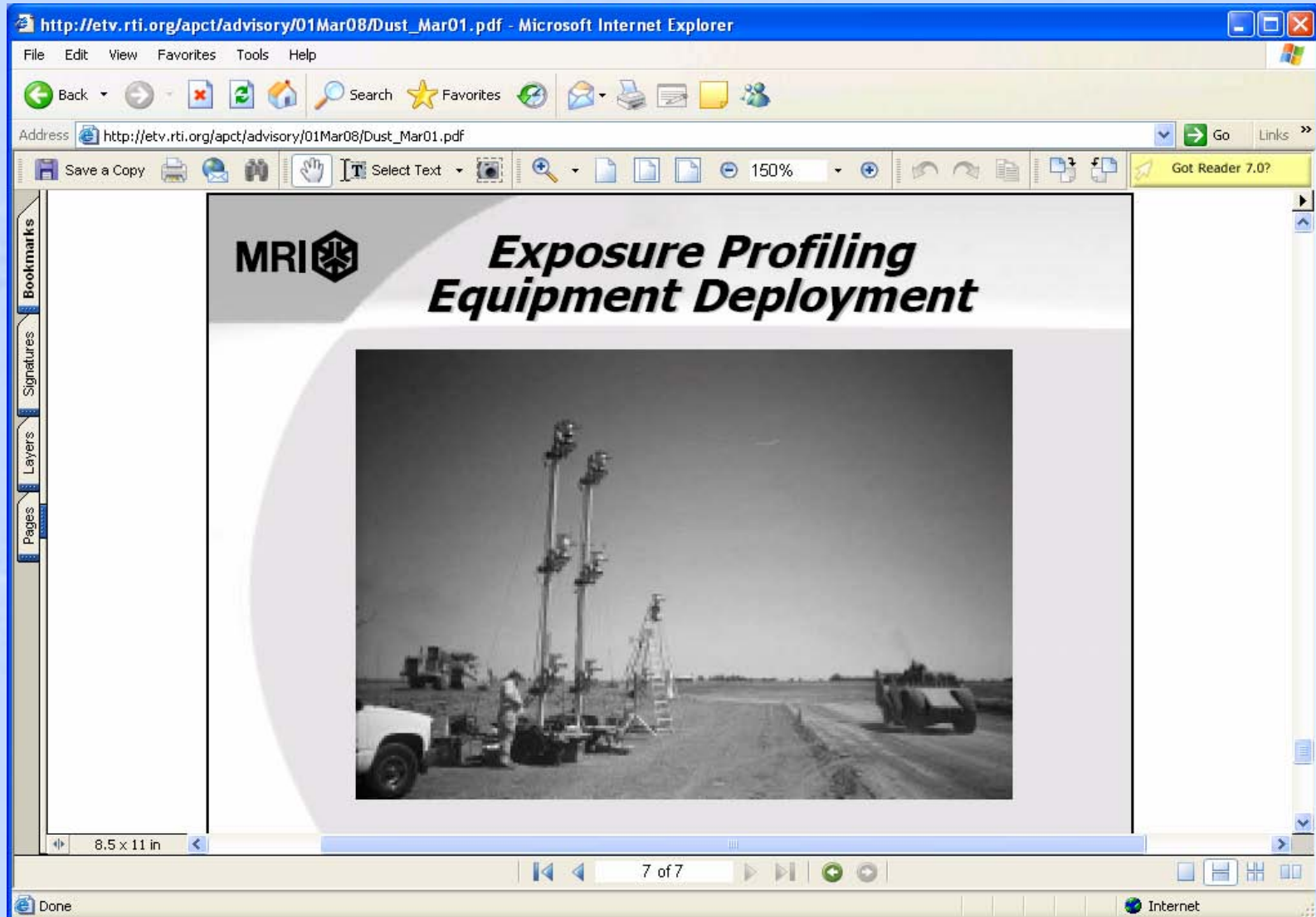
| | | | |
|-------------------------------|--|------------------------------|----------------------------------|
| Auxiliary Engine | John Deere 4045TF (115 hp) | Dumping Height Max | Ground level |
| Sweeping Vacuum System | 20,000 CFM (566 m ³ /min./min.) | Dump Location Chassis | Rear Conventional or Cab-Over |
| Sweeping Path Max | 12 ft. (3658 mm) | Travel Speed | 55 mph (88 km/hr) |
| Hopper Capacity | 8 cu. yd. (6 m ³ /min.) | | |
| Water Capacity | 240 gallons | | |

Done Internet

Exposure Profiling Method



Exposure Profiling Method



MPCA Expectations - Silt Loading

■ MPCA Expectations

- Good documentation for proposed silt loading values
- Companies will do some (extensive) on-site testing/cleaning, or use
 - AP42 Table 13.2.1-4 (Industrial Facilities)

■ Permit Requirements

- Cleaning: sweeping, vacuuming, washing
- Frequency: daily, weekly, monthly, annual
- Testing: silt loading and/or exposure profiling

■ Other possible solutions

- Speed limits
- Salt applications only – no sanding
- EMISFACT scalars (e.g., SHRDOW7)

Silt Content – Unpaved Roads

- MPCA Title V Default: 10%
- EPA AP-42 Range for Industrial Sites
 - Mean Silt Content: 4.3 – 24%
 - Range of Values: 0.2 – 29%
- No recent testing in Minnesota
- Usual control: paving or watering or chemical dust suppression

Cooling Towers

- EPA Guidance: AP42 Emission Factors
- MPCA Emission Guidance (EPA or below)
 - Reisman and Frisbie
 - “Calculating Realistic PM10 Emissions from Cooling Towers”
 - MPCA Leads Meeting (Jan. 2002)
- Model as point sources or volume sources

Fugitive PM10 Summary

- MPCA recommends that proposed silt values be part of the modeling protocol
- Silt loading values from Table 13.2.1-3 will be less scrutinized for public areas and campus-like cases
 - Public roads/highways (city, county, state, and federal)
 - Very light industry/manufacturing (e.g., IBM-Rochester)
 - Often minor or synthetic minor sources
 - Schools, universities, hospitals, R&D sites, etc.
 - Unpaved areas/shoulders are red flags (track-out)
 - Good Behavior: ISO14001, approved EMS, aggressive testing, etc.
- Silt loading values from Table 13.2.1-3 will be closely scrutinized for industrial facilities – examples (often major or PSD sources):
 - Moderate industry (e.g., agriculture, ethanol)
 - Heavy industry (e.g., refinery, paper mill, mining)