Meeting to Discuss Fine Particulate Matter ($PM_{2.5}$) Issues Related to Mirant's PRGS

Presentation

By

City of Alexandria

February 20, 2008

Purpose of SIP

- SIP is a full suite of control measures, monitoring and permitting programs

- Programs are “necessary to assure that ambient air quality standards are achieved” within all “areas covered by the plan.” [Section 110(a)(2)]

- It is appropriate for MWAQC, as regional planning body, to insure that SIP meets its intent and is not merely an administrative exercise

Unique Circumstances Warranting Local $PM_{2.5}$ Modeling

- Short stacks
- Documented downwash issue
- Monitored exceedance of SO_2 NAAQS
- Increased PM emissions because of sorbent injection

To insure NAAQS compliance, local scale PM2.5 modeling must be done

EPA's $PM_{2.5}$ SIP Implementation Rule & Guidance on Use of Models For Demonstrating Attainment

- Both documents acknowledge there are cases where local modeling analysis is warranted

- City believes area around PRGS, because of its unique characteristics, meets the intent of when local scale modeling should be done

AERMOD Implementation to Assess $PM_{2.5}$ Impacts is Technically Sound

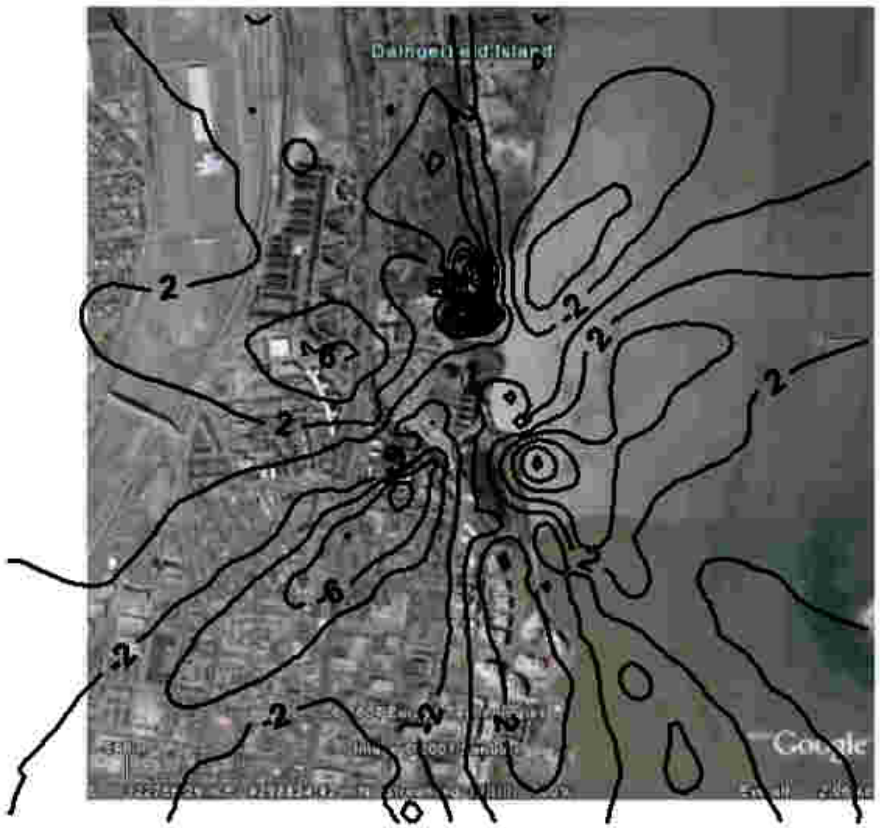
- SIP attainment guidance discusses important role of local-scale modeling for evaluating impacts of primary $PM_{2.5}$
- Other states have adopted final modeling and policy documents using AERMOD (or similar) to determine $PM_{2.5}$ permit limits
- AERMOD designed now for 98^{th} percentile demonstrations

AERMOD Results for Primary $PM_{2.5}$ Impacts - Five-Stack Configuration

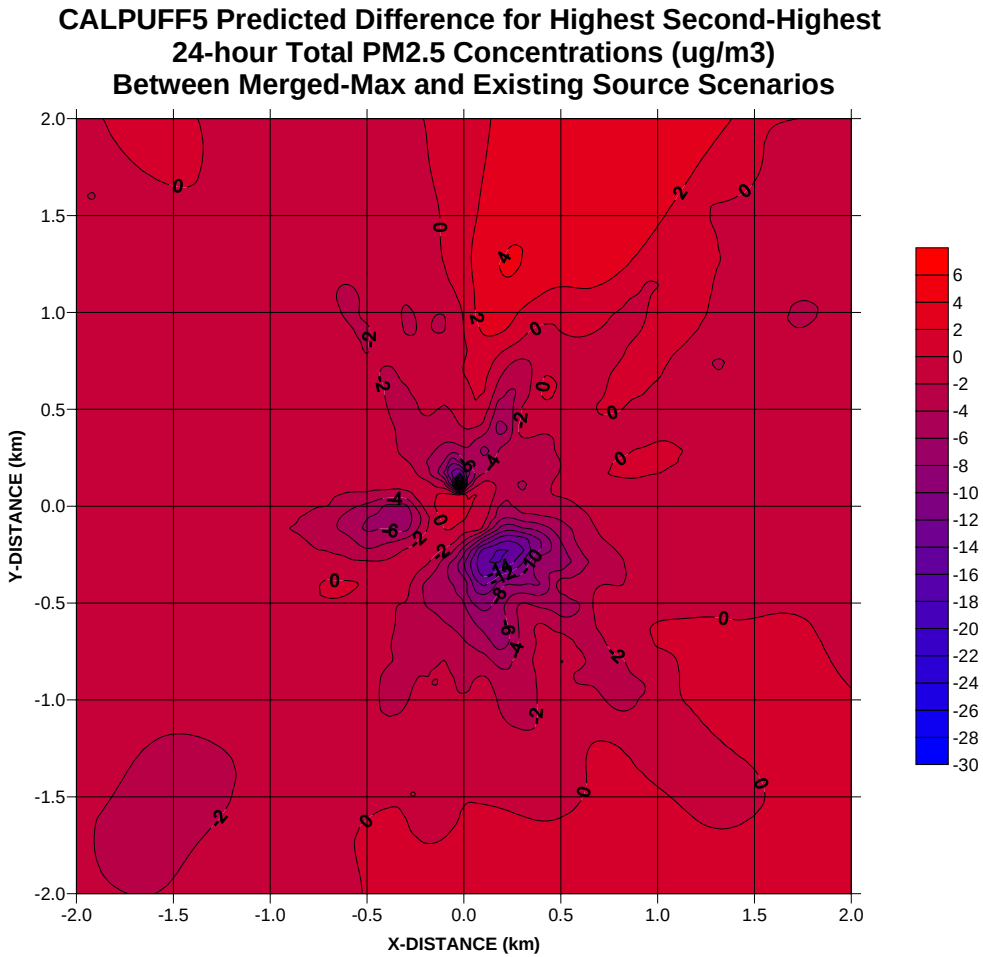
	8th highest	98%-tile Background (04-06)	Total Impact
3-base – 24hr (2001)	18.6	34.1	52.7
2-base -24hr (01,03-06)	12.1 (avg. of 3-yrs)	34.1	46.2
2-base- annual (01, 03-06)	1.9 (avg. of 3-yrs)	14.2	16.1
Notes: Assuming $PM_{2.5}$ at 0.03 lb per MMBtu.			

Merge Stack Operation Increases Direct PM2.5 Impacts to SW, NE of Plant (Highest 24-Hour, One Year)

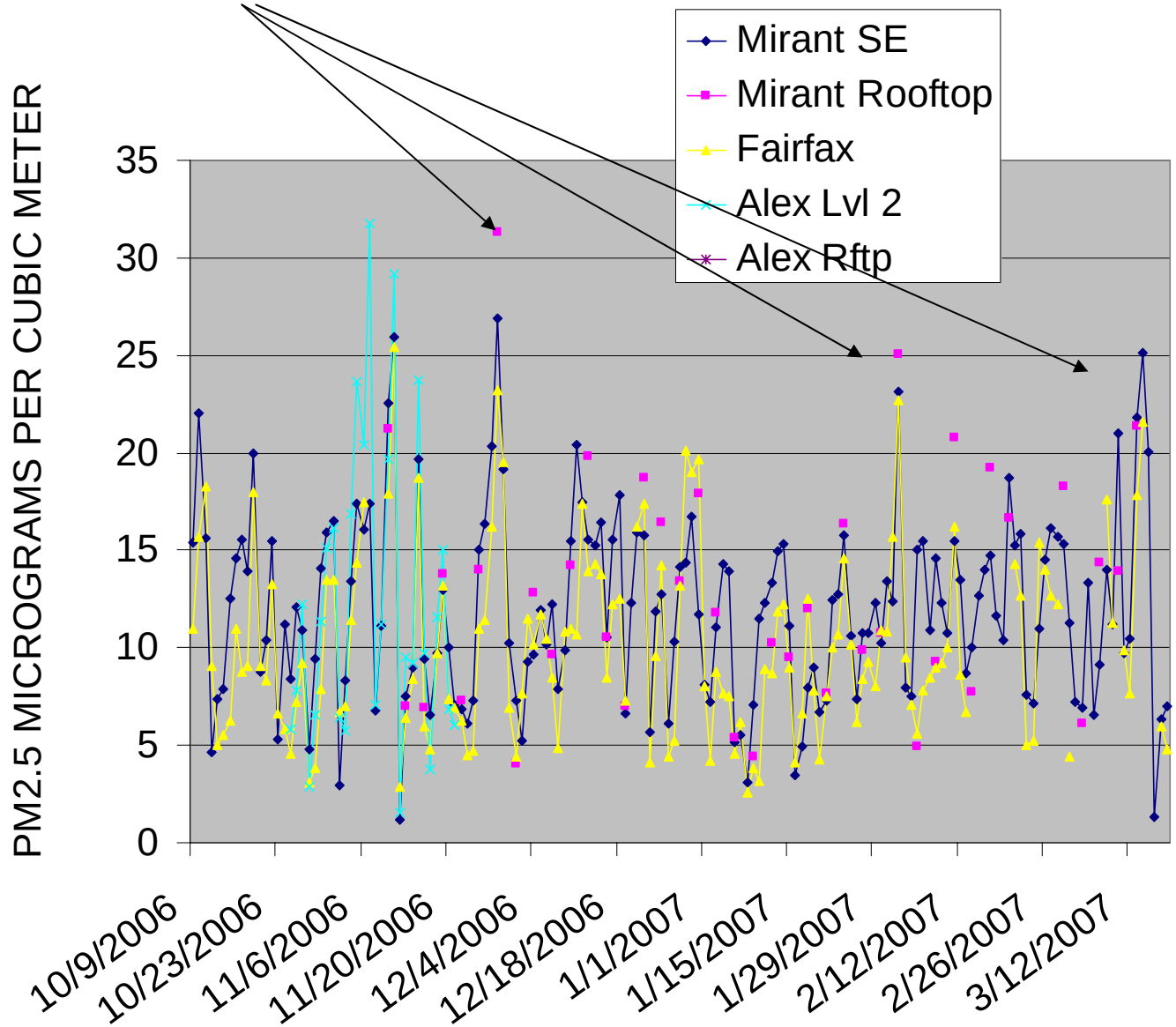
INCREASE IN MAX 24-HOUR PM2.5
FOR MERGED STACK CONFIGURATION
THREE TO FIVE BOILERS MID LOAD
YEAR 2001



CALPUFF'S TOTAL PM2.5 RESULTS ALSO SHOW MERGED STACK INCREASES IMPACTS IN SOME AREAS (2nd-highest, one year)



Monitoring in Oct. 06 to Mar. 07 Period Shows Significant Differences between Fairfax and PRGS



No Monitoring Results for Wind Directions from Northeast and East

- Why is it important? Merged-stack simulations show that this area will see an increase in impacts over the five-stack configuration for a common operational scenario.
- Max. impact will occur along southwestern fenceline, for winds from north-northeast.
- WTS shows high impacts along western regions of plant.
- Monitor results 4/10 mile away to the S-SW showed overall greatest daily impact in November, 2007 (possibly other months).
- S/W Monitor should instead be about 1/10 mile away, right on fenceline.


24-hour Max = 100
24-hour Max = 71
24-hour Max = 97
24-hour Max = 187
November Max. SO2 24-hour averages at Locations Shown (Northeast and Daingerfield = 28 and 20)
1st St, Alexandria, VA 22314
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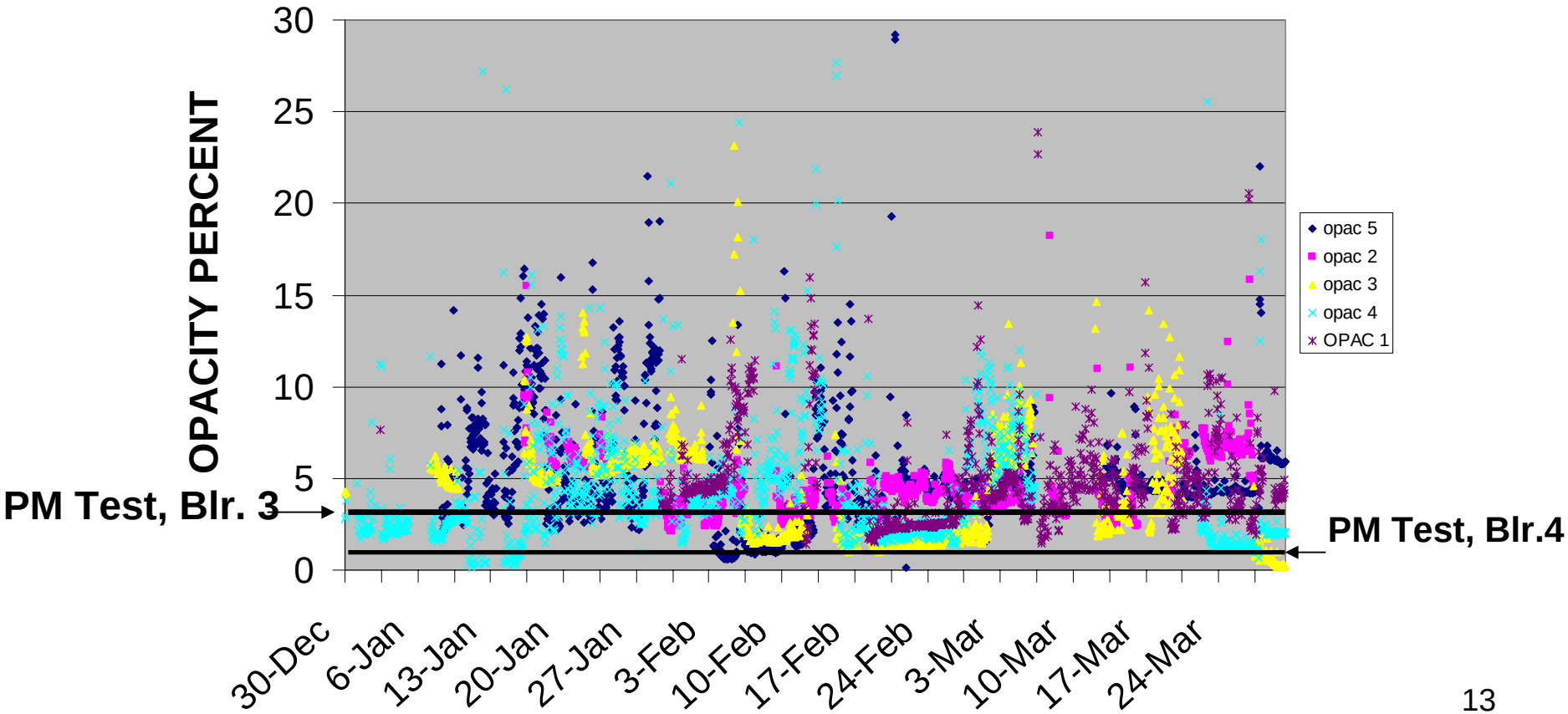
Overall Maximum Impact in Wind Tunnel Study Occurred on West Wing -- Mirant Monitor is on South Wing

TABLE 4

Number of Scenarios where Maximum Impact Occurred and 1-Hour SO_2 Impacts			
	North Wing	West Wing	South Wing
No. of Scenarios out of 20 Simulated	3	7	10
1-Hour SO_2 Values on Other Wings when Overall Maximum Occurredon West Wing	3,006 $\mu g/m^3$	5,438 $\mu g/m^3$ (overall maximum)	893 $\mu g/m^3$
Selected Values at Lower-level Heights	2,081 $\mu g/m^3$	4,604 $\mu g/m^3$	3,907 $\mu g/m^3$

Hourly Averages of Opacity Show Continuous Exceedance of Levels Measured during PM Tests

OPACITY SERIES BLRS 1-5 1ST QUARTER 2007



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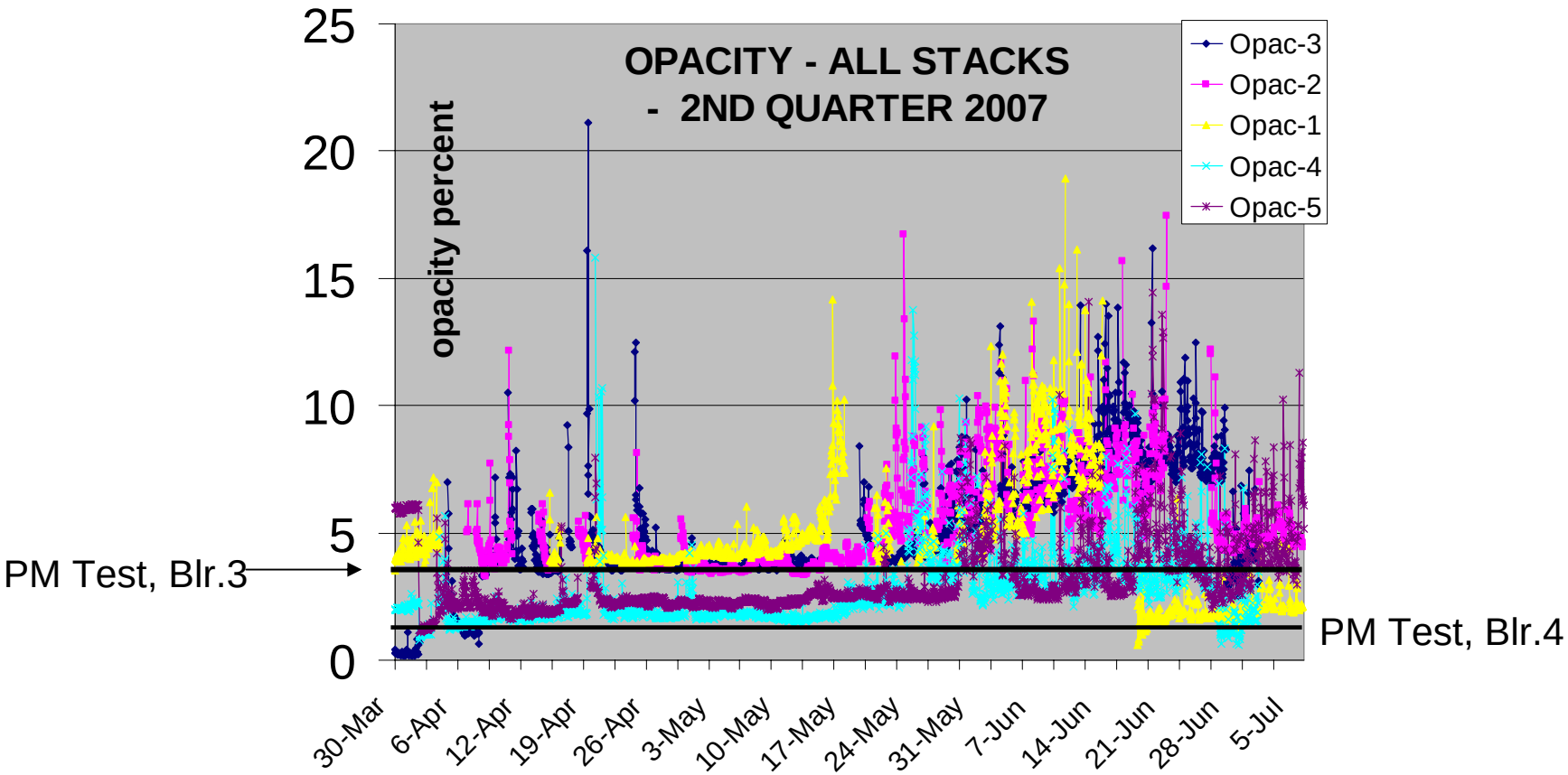
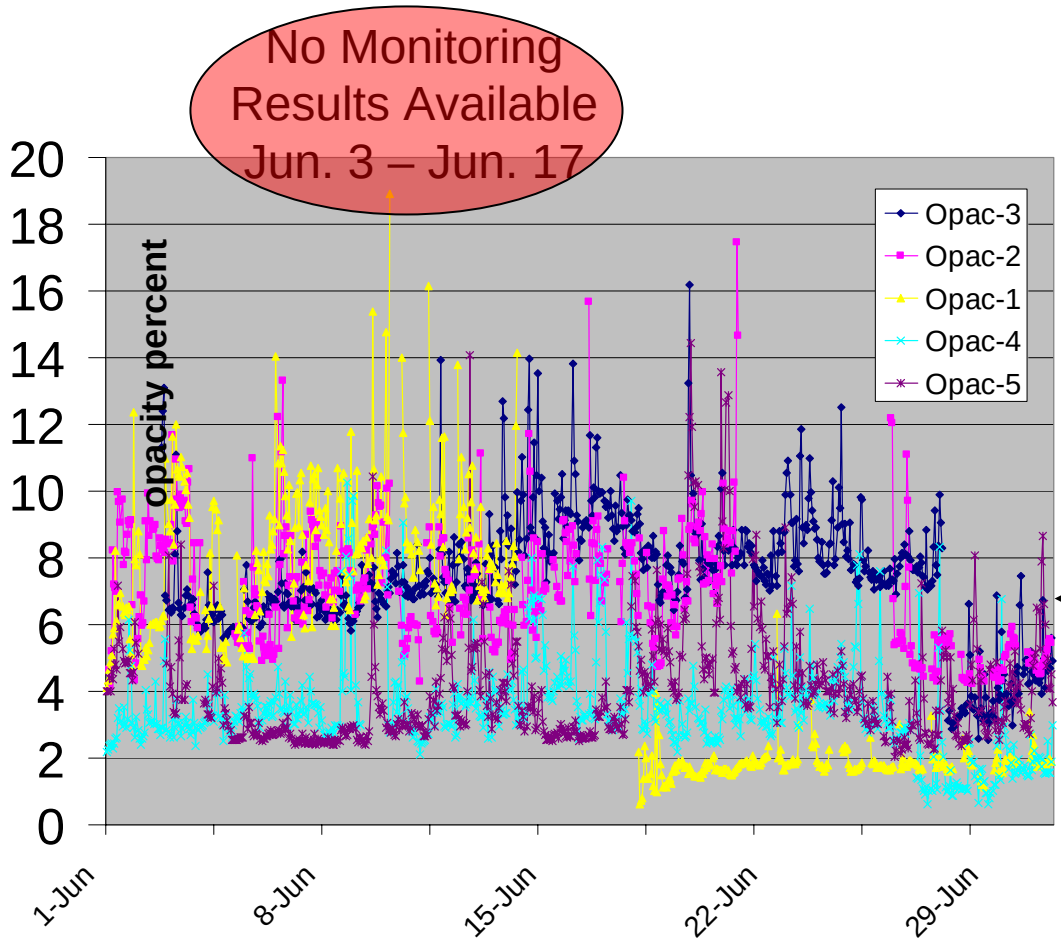
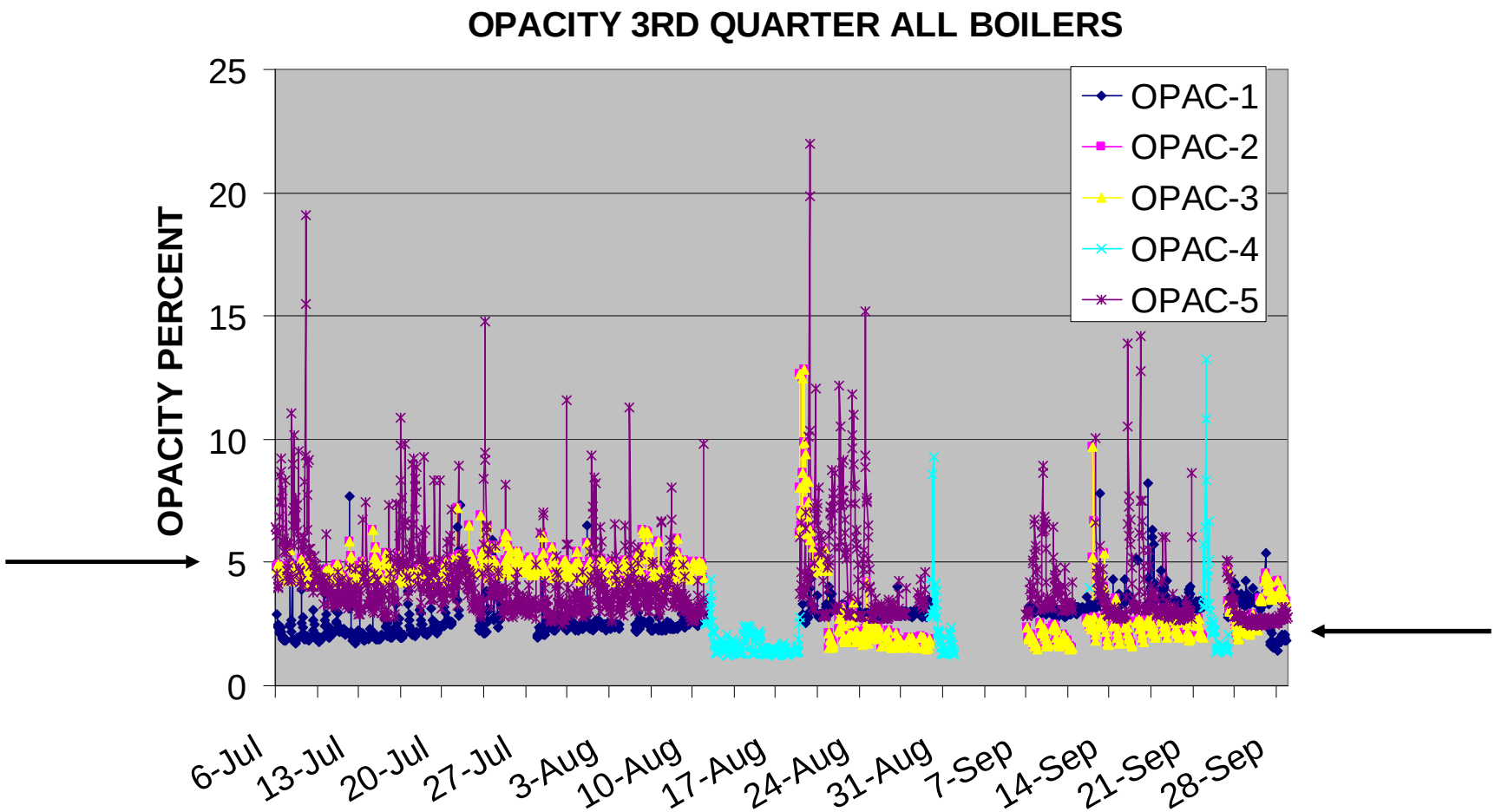


High Opacity Levels Occur with All Five Boilers Running (as in Merge Stack Configuration)

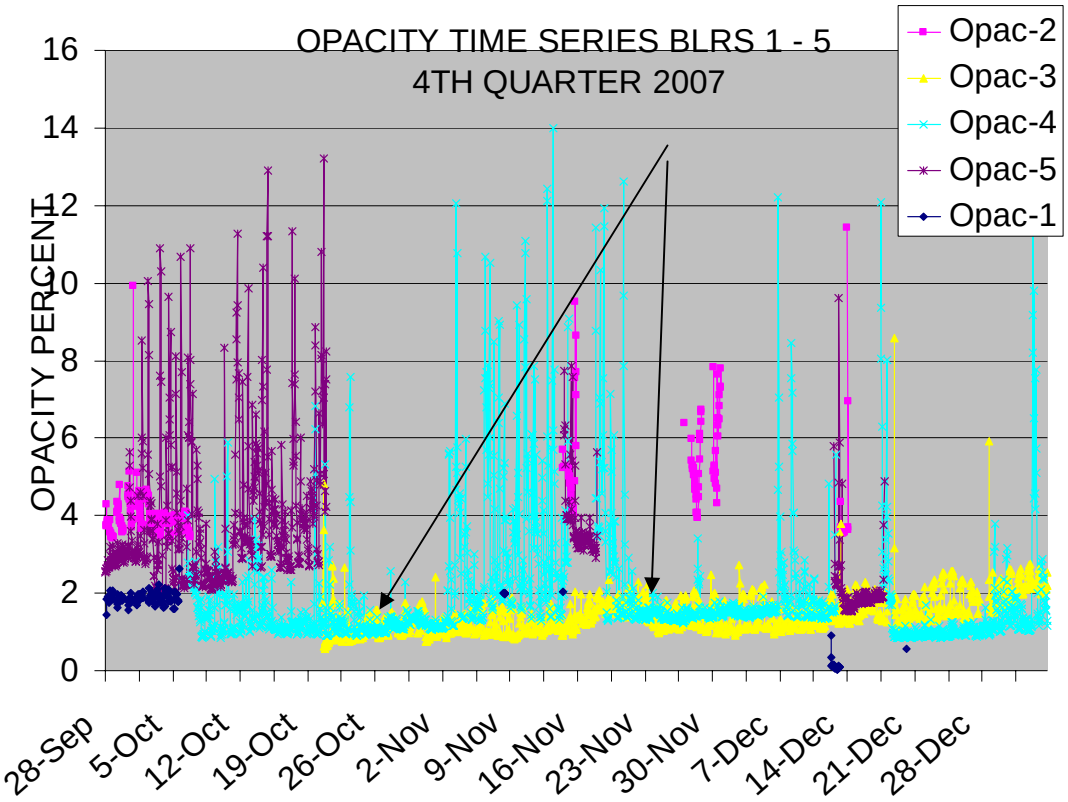


Why Step Changes in Opacity?

Step Changes in Opacity Occur



Time of PM Testing Shows Low Opacity



Including All Conditions of Operation, Trona Increases $PM_{2.5}$

- Effect cannot be determined by any one snapshot in time.
- Highly-controlled short-term test conditions do not include soot-blowing, other discrete operational events
- Soot blowing, process upsets likely more frequent with sorbent injection

Effect on $PM_{2.5}$ by Trona Indicates Increase in $PM_{2.5}$ for this Physical Modification

Boiler	Average Opacity		% Increase in Opacity, %
	Pre-Trona (Jun-Aug 2005)	Post-Trona (Jun-Aug 2006)	
1	2.86	6.03	110.8
2	4.16	6.76	62.5
3	3.62	3.74	3.3
4	2.61	3.10	18.7
5	2.55	4.10	60.8

SIP Establishes Statutory Basis for Local Permitting

- Virginia's 9 VAC 5-80-1180.A.3 prohibits the issuance of a permit unless the facility has been "*designed, built and equipped to operate without preventing or interfering with the attainment or maintenance of any ambient air quality standard (AAQS) and without causing or exacerbating a violation of any applicable ambient air quality standard".*
- *Any air permit* falls into the above category – this statutory requirement applies regardless of NSR applicability.

SIP Establishes Statutory Basis for Local Permitting

- As indicated by EPA, SIP is appropriate process to address this local hot spot

- Permit must be issued by state, consistent with SIP to insure NAAQS compliance

THANK YOU

QUESTIONS?

$PM_{2.5}$ SIP Goals are Exacerbated by Issuance of Permit for Region's Largest $PM_{2.5}$ Emission Source that Excludes PM $_{2.5}$ Limits

- PM $_{2.5}$ Permit Limits must be PM $_{2.5}$ NAAQS-based in this nonattainment area.

- By lack of design around $PM_{2.5}$ compliance, Mirant takes credit for a "prohibited dispersion technique" (prohibited by SIP requirements in Section 51).

- Permit limits support important SIP $PM_{2.5}$ Inventory Requirements as well.

US EPA STUDIES SUPPORT PM CEMS AS RELIABLE

- "Evaluation of Particulate Matter Continuous Emission Monitoring Systems"(2000) states:
  - All three systems met daily drift criteria
  - All three system met the draft PS-11 correlation criteria
- "Review of Concurrent Mass Emission and Opacity Measurements for Coal-burning Utility and Industrial Boilers" (1980):
  - All 17 test sessions on coal-fired Georgia Power utility boilers, ***particulate mass emissions are positively correlated*** with opacity.

Continuous Assurance Monitoring Required for PM

- Opacity levels vary widely with all five boilers running
- What is the explanation for step changes in opacity levels?
- Monitoring of ESPs volts, amps should be continuous instead of once per day
- ESPs parameters that maximize control should be established
- ESPs possibly need feedback controls

PRGS's Comprehensive Air Permit must Establish NAAQS-Compliant Emission Limit

- Region's largest source of primary $PM_{2.5}$ emits 100 to 300 tons annually
- Immediate area around plant fits meaning of "unmonitored hot spot"
- "Virtually all nonattainment problems appear to result from a combination of local emissions and transported emissions…"
- *"EPA believes that local and State emission reduction efforts will need to play an important role in addressing the PM2.5 problem…" [Clean Air Fine Particle Implementation Rule]*

Merged 2-Stack Permit Allows Dispersion Credit for PM2.5

- Designing in absence of PM2.5 Impacts Allows Increased Output
- Increased output is equivalent to dispersion credit.
- Increased output leads to even GREATER EXCEEDANCES of PM2.5 health-based standards for many areas around plant with significant population.

Annual Emissions of Direct $PM_{2.5}$ Are Allowed to Increase with Physical Modification

	5-Stack SOP	Post-modification SOP
$PM_{2.5}$ Annual Limit	163 tons	No limit

Monitoring does not Make a NAAQS Demonstration

- No monitoring on Harbor Terrace (although required by Administrative Consent Order) or immediate area
- No monitoring at location along southern-most SE fenceline
- Wind tunnel showed great variation in points of maximum impact on Marina Towers

Alexandria believes that SIP Requires, and that Region Will Benefit by:

- $PM_{2.5}$ NAAQS-compliant annual and short-term limits in the five-stack SOP, consistent with no dispersion credit.
- Baghouses on all five boilers to protect $PM_{2.5}$ NAAQS and public health of region.
- Continuous compliance with PM emission limits requires PM CEMs and continuous parametric monitoring for all five stacks.