



[trinityconsultants.com](http://trinityconsultants.com)

# Challenges with Modeling the 1-hr SO<sub>2</sub> NAAQS Standard: An Aluminum Plant Case Study

March 15, 2012

Ashley Jones  
co-author: Kasi Dubbs



# Background

- > 8/4/2010 - Plant was issued a PSD permit for expansion.
  - ❖ Permit requires \$18 million in changes to achieve modeled compliance.
  - ❖ Permit requires that existing potline stacks be raised from 37.8 m to 65 m
- > 8/23/2010 - Effective date for 1-hour SO<sub>2</sub> NAAQS
- > 11/1/2010 - Plant applied to amend PSD permit to optimize stack changes required for modeled compliance.
  - ❖ Application addressed the 1-hour SO<sub>2</sub> NAAQS.
  - ❖ Application requested a 42 m stack on the existing potlines rather than a 65 m stack (as was in the existing permit)

# Background

- > 2/28/2011 & 3/13/2011 - EPA releases AERMOD Version 11059/11103. State agency had not yet approved the permit amendment requested 11/01/2010.
- > 8/11/2011 - State agency says 42 m stack (as requested in application for permit amendment) will not achieve modeled compliance with SO<sub>2</sub> NAAQS.
- > 42 m complies with SO<sub>2</sub> NAAQS using the old version of AERMOD, but not new version.
- > Noncompliance tied to the change in downwash algorithms
- > Existing PSD permit allows expansion if build a stack at 65 m (GEP), but it was determined that the new version of AERMOD does not show modeled compliance at the GEP height.
- > Plant is weighing the need to move forward with expansion (i.e. building the stack at 65 m) while considering the upcoming SO<sub>2</sub> 1-hour SIP requirements (65 m no longer enough).

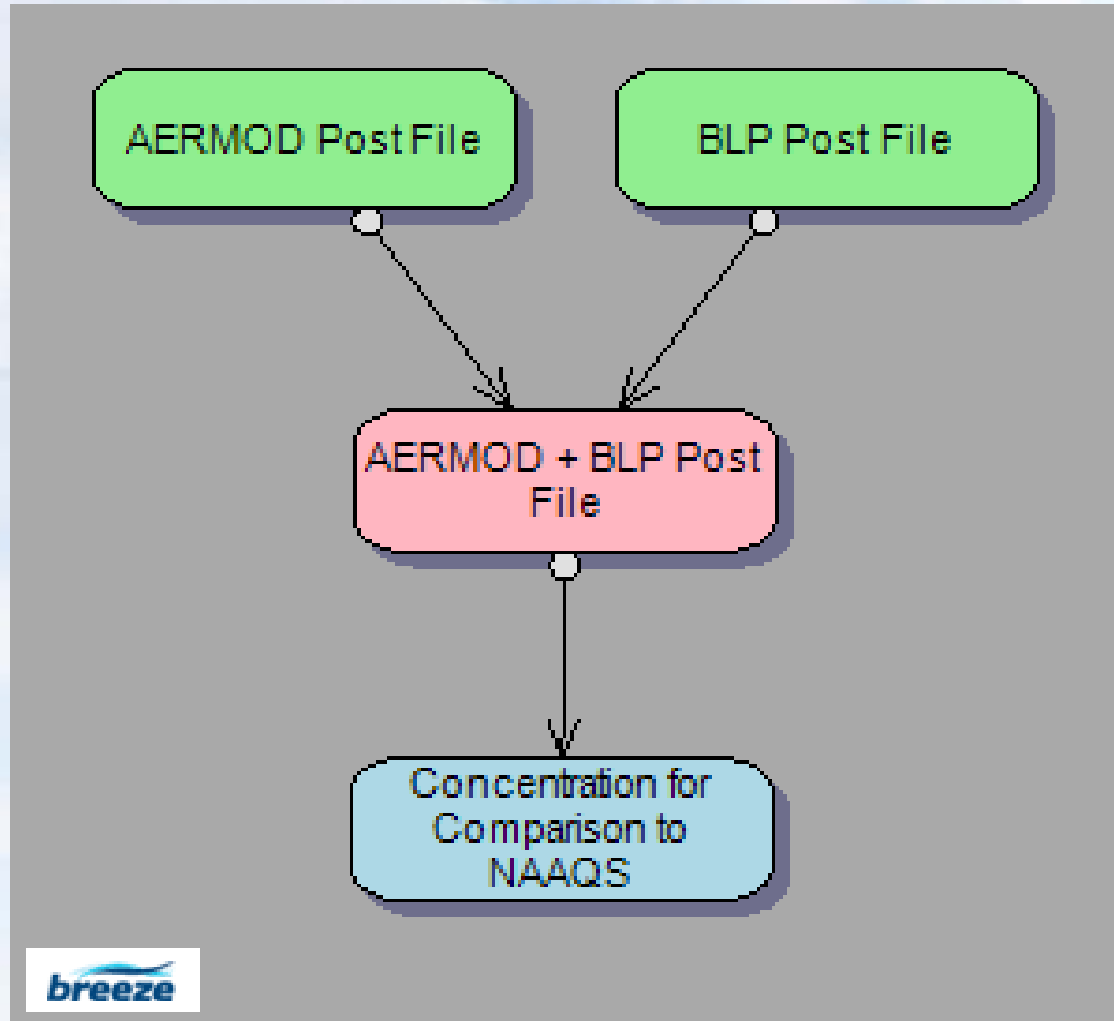
# Challenges: Overview

- > Focus on raising stack height is no longer a likely solution
- > Evaluating what SO<sub>2</sub> rate it takes to achieve modeled compliance, while considering that add-on SO<sub>2</sub> controls for potlines are not common (one plant in U.S. currently operates wet scrubbers on potlines for SO<sub>2</sub> control).
  - ❖ Would cost plant >\$25,000/ton SO<sub>2</sub>
  - ❖ Cost prohibitive for BACT
- > Modeling uses BLP model for roof vents and AERMOD for all other sources
  - ❖ Modeling challenge: Combining BLP and AERMOD, spatially and temporally

# Challenges with BLP + AERMOD

- > 100 receptor limitation in BLP
  - ❖ Solution: Recompile BLP program (no longer EPA's program) to allow additional receptors
- > Combining BLP and AERMOD impacts spatially and temporally
  - ❖ Solution: Recompile BLPPost program (no longer EPA's program) to output binary post files that can be combined with AERMOD post files.

# Example of BLP + AERMOD Solution



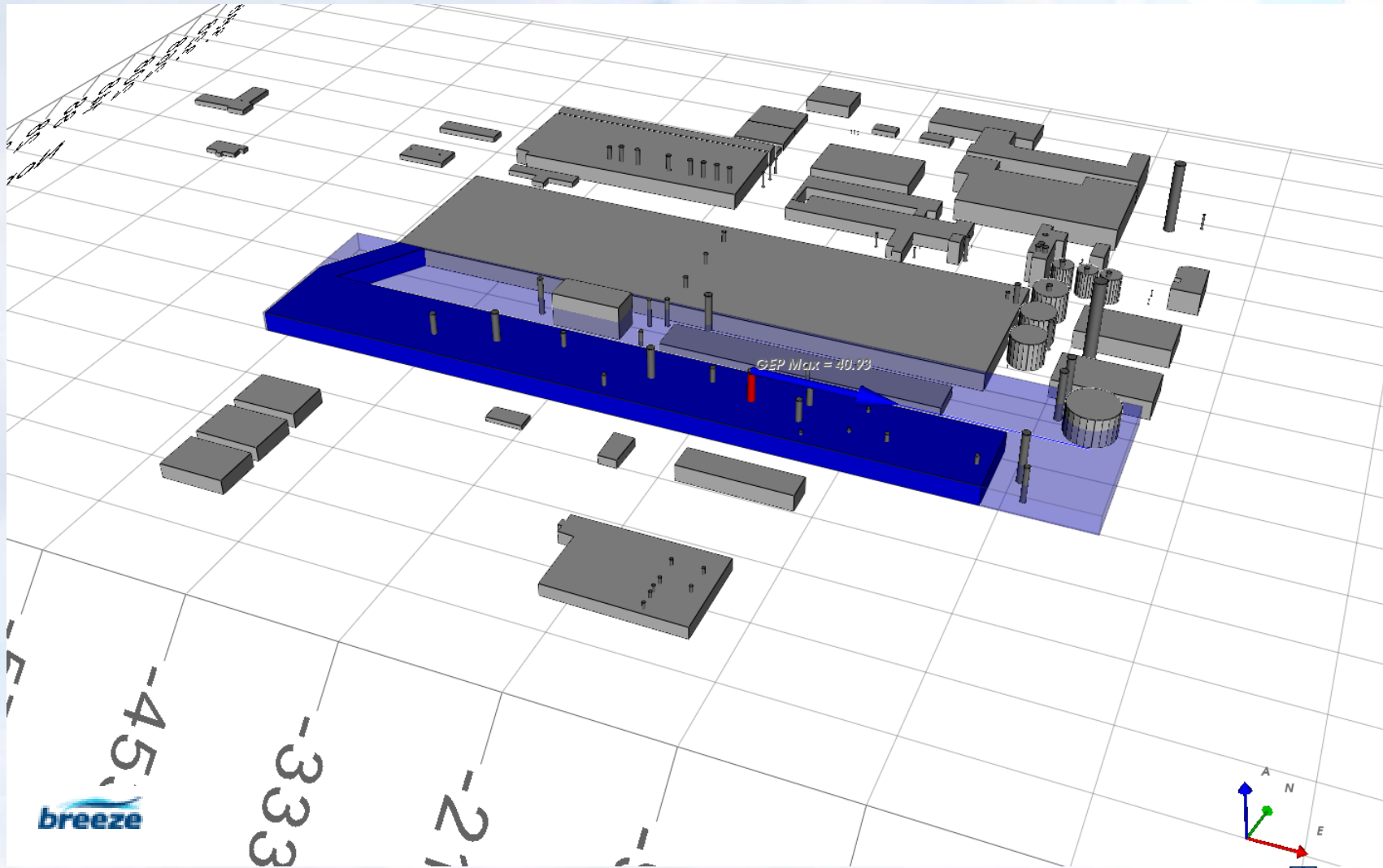
# Challenges with V11103



	Model Version	Meteorological Data	Modeled Stack Height (m)	EPA Formula Height (m)	GEP Height (m)	AERMOD Concentration $\mu\text{g}/\text{m}^3$	AERMOD + BLP + Max. Background Concentration $\mu\text{g}/\text{m}^3$	1hr SO <sub>2</sub> NAAQS Standard
Original SO <sub>2</sub> 1hr Modeling	v09292	2003-2007 v06341	42			144	189	
Version Change	v11103	2003-2007 v06341	42	41	65	1292	No Data Collected	196
Version and Met Data Change	v11103	2005-2009 v11103	42			1332	1416	
Stack Height Iteration	v11103	2005-2009 v11103	GEP			504	578	

- > Increase from version change was pinpointed as a downwash issue. Meteorological(updated time period and AERMINUTE) data also increased concentration.

# Challenges with V11103





# Downwash Challenges with V11103 (MCB#4 - February 28, 2011)

- > 'WAKFLAG' subroutine modified to no longer "turn off" downwash once the stack height is greater than or equal to the EPA formula height.
- > However, no guidance on being able to take credit for stacks taller than GEP and recent clarification memo (Alcoa) is discouraging to equivalent building dimension studies.

# Summary

- > Determining a modeled solution is still an on-going process as is the case with many trying to comply with the SO<sub>2</sub> 1-hour NAAQS. In this situation finding a solution has been made even more difficult with the recent change in the WAKFLAG routine.
- > Appears as if controls in excess of \$25,000/ton may be needed to achieve modeled compliance.
- > Will any relief come from the pending downwash guidance? (grandfathering, credit for stacks above GEP, streamlined EBD approaches)?
- > In addition to waiting for downwash and SO<sub>2</sub> SIP guidance, the facility is initiating a field study to better understand the plant's monitored impacts versus the modeled impacts.

# Questions?

Trinity Consultants - Kansas City Office

Ashley V. Jones

Kasi Dubbs

(913) 894-4500

[avjones@trinityconsultants.com](mailto:avjones@trinityconsultants.com)

[kdubbs@trinityconsultants.com](mailto:kdubbs@trinityconsultants.com)