Four Replicated Metam Sodium Flux Studies on Shank Injection / Compaction

Sponsored by Metam Alliance

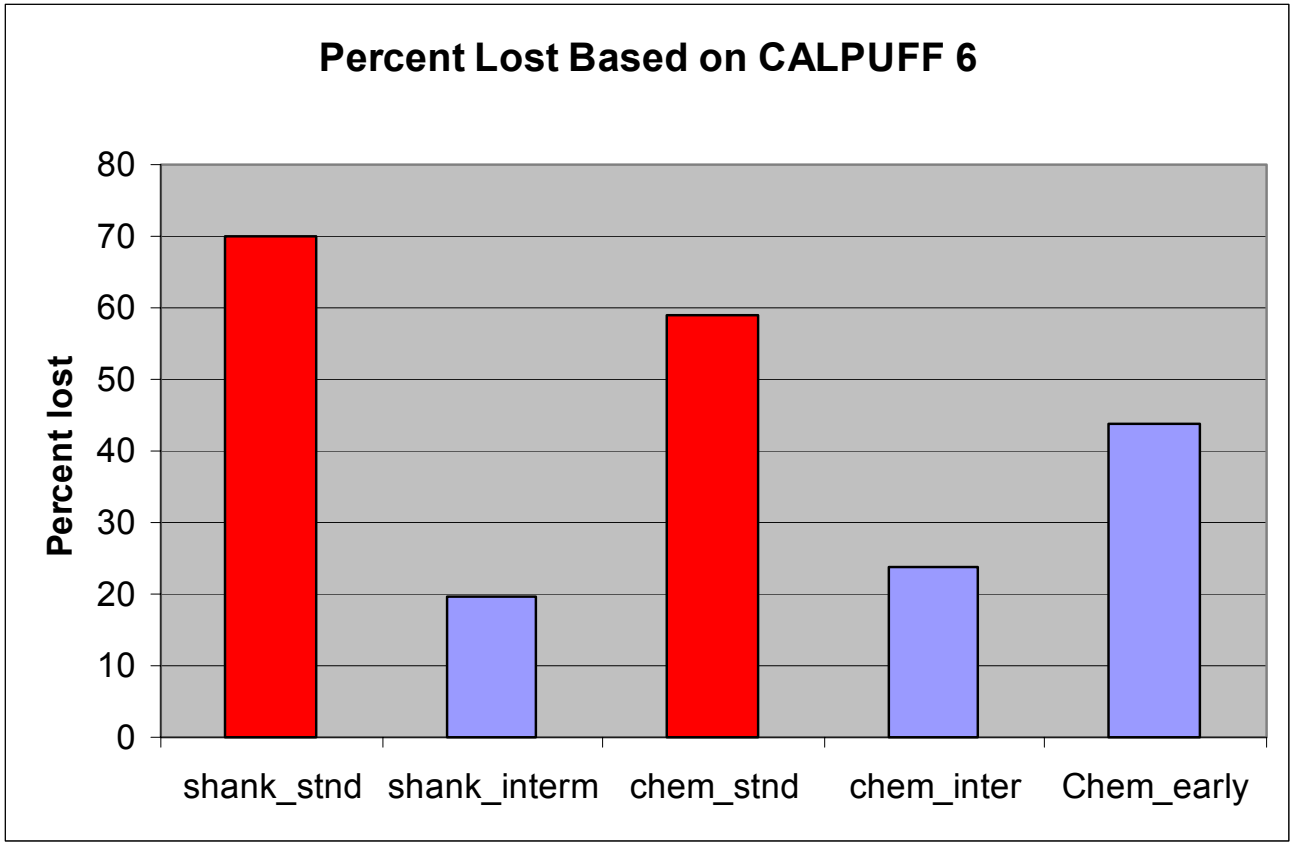
Jointly Conducted by Research Team of Sullivan Environmental and Dr. Husein Ajwa

Outline of Presentation

- Background: need for emission reductions & Benefits of Shank injection / compaction
- Initial trials 2007
- Follow-up trials 2008
- Emission Results 2008
- Conclusions

Background

Background- - High Loss Rates Found for Standard Methods



Enhanced water sealing = further improvement, but still ~ 20-40 % loss

Why Shank Injection Favorable in Terms of Off-Gassing?

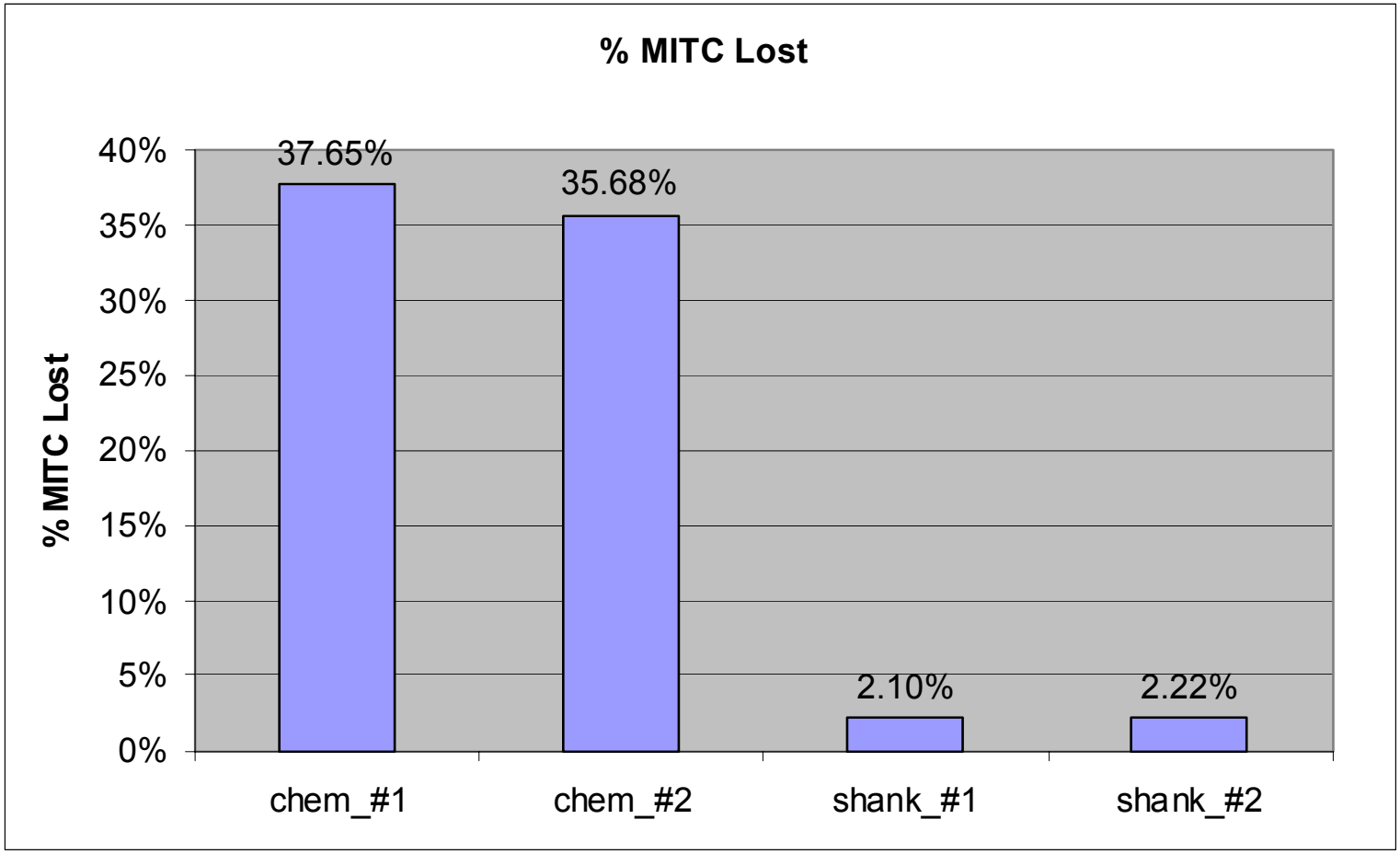
- Surface losses effectively eliminated
- Good shank design removes voids
- Effective water management promotes compaction
- Amenable to subsequent water sealing (dual seals)

2 Fields 2007

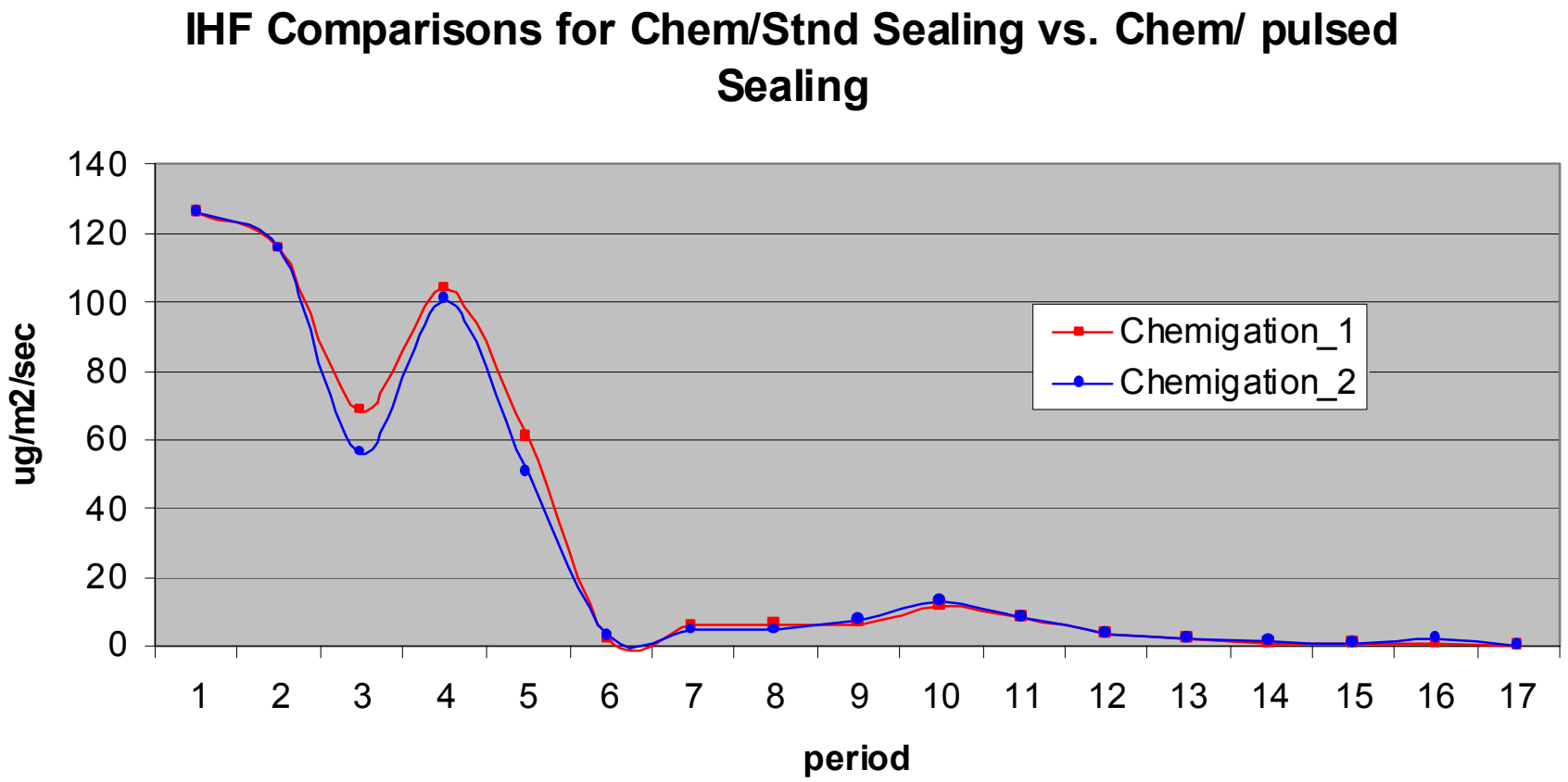
2007 Shank Injection / Compaction Field Trials

- 2 treatments by shank / compaction
- 2 treatments by chemigation
- Both were nighttime applications
- 3 levels monitored per field
- ~ 2 percent loss over four days by shank / compaction

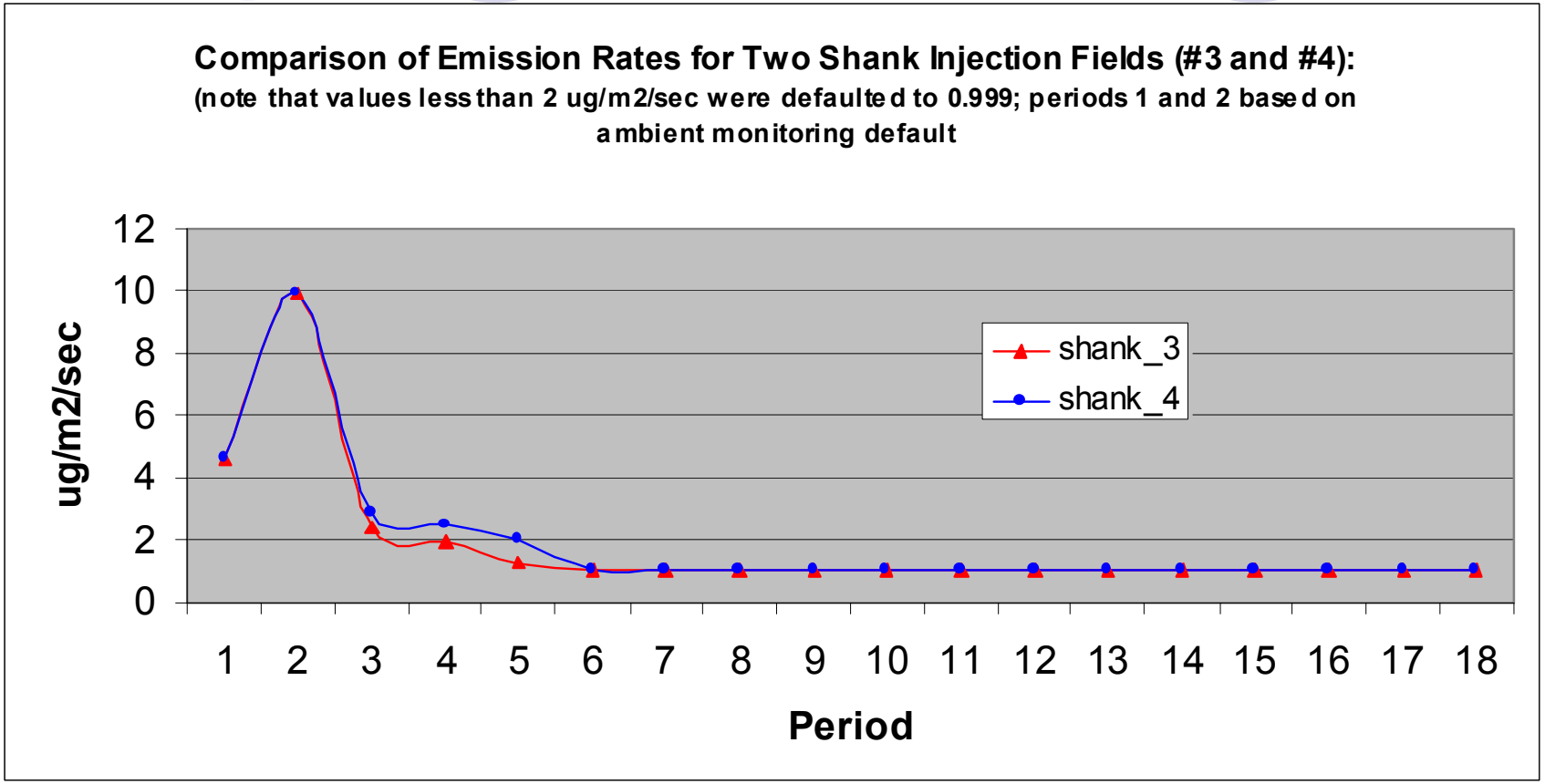
Comparison of Loss Rates Chemigation vs. Shank Injection: 2007 Study



2007 Study - - Chemigation Treatments



2007 Treatments Shank / Compaction



Low emissions by Period 6 (1st 24 hours) - - <=1 ug/m2/sec after

Method Technical Refinements

- Improved laboratory detection limit (issue for shank injection because of low emissions)
- 5 levels instead of 3 levels
- Merged meteorological profile onto 1 representative field (6 levels instead of 3)

2 Fields 2008

Follow-up Trials in 2008

Application Rig: Trials in 2008

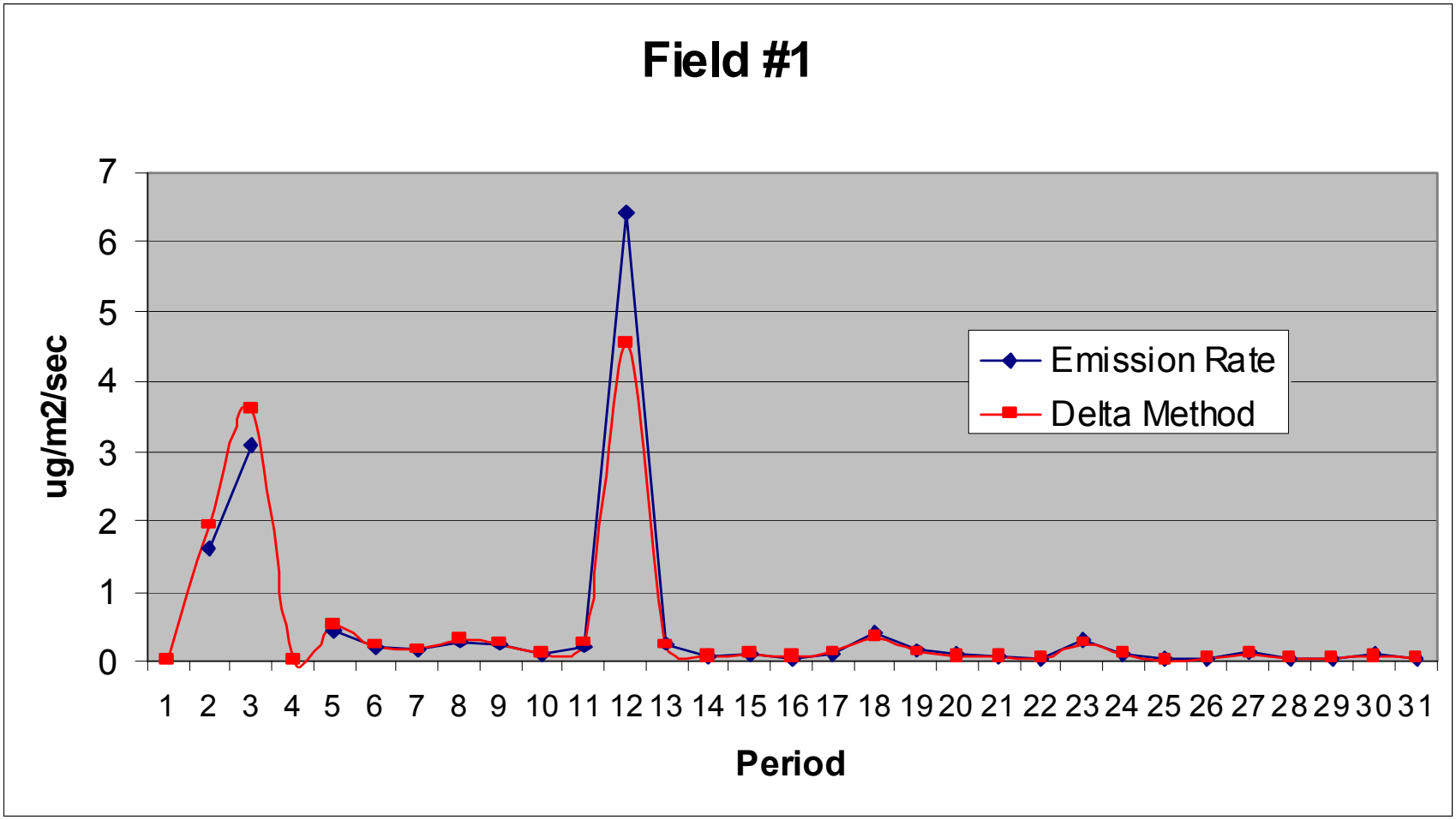
Close Up of Shanks / Compaction Device: Trials in 2008

Set-Up On-Field Monitoring: Trials in 2008

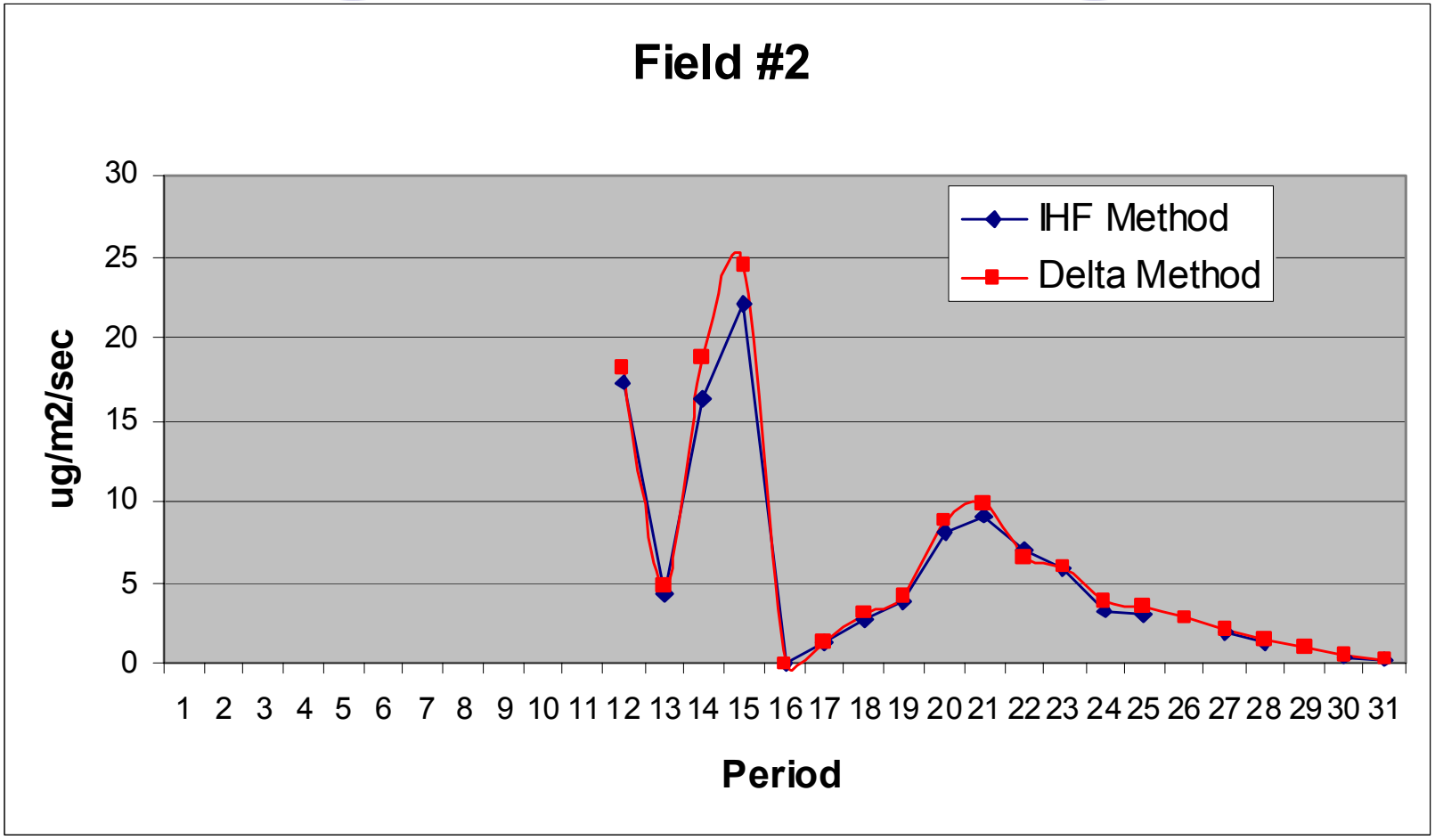
Field Conditions After Application: Trials in 2008

Results of 2008 Study

Field #1: Daytime Application

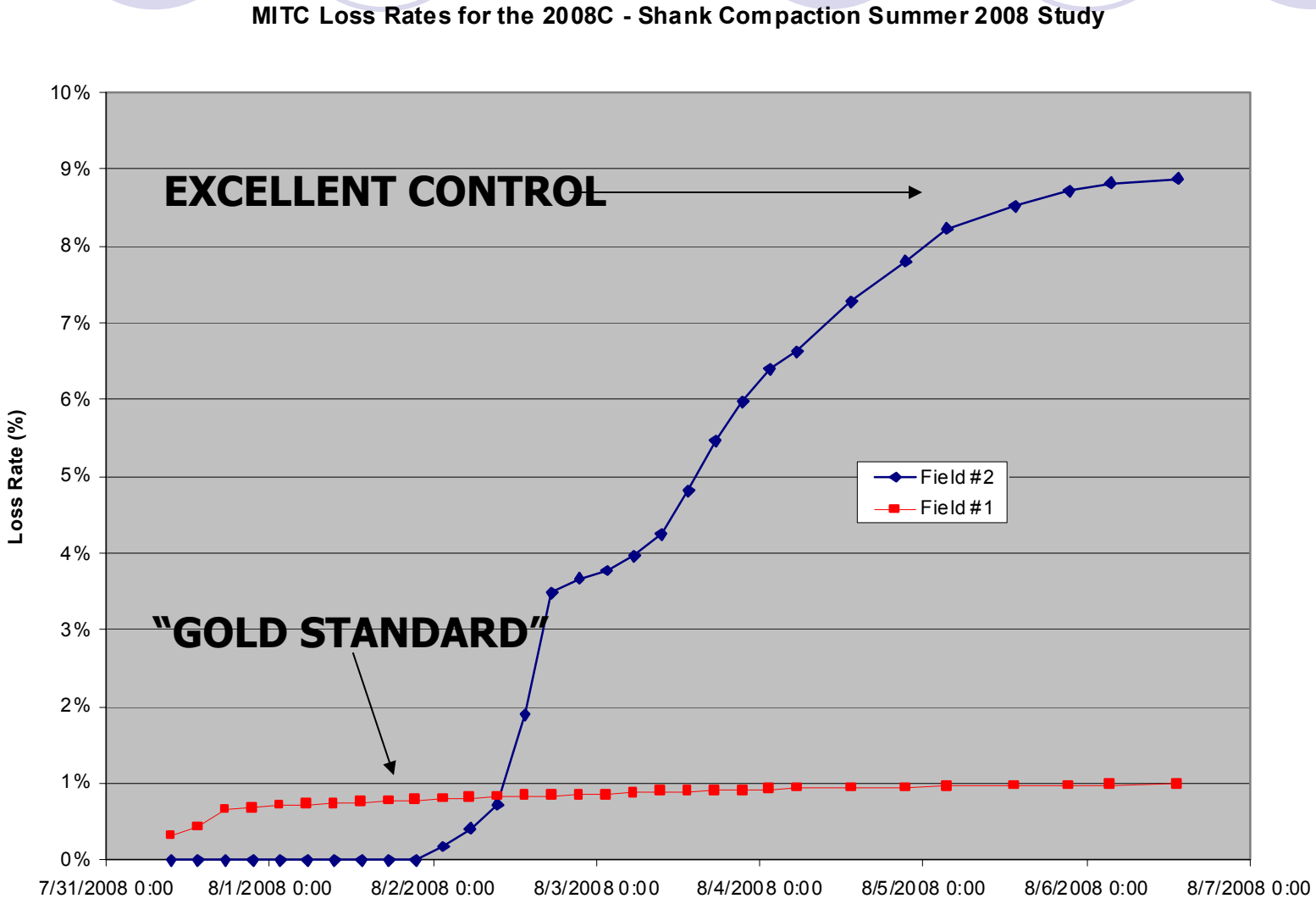


Field #2: Nighttime Application

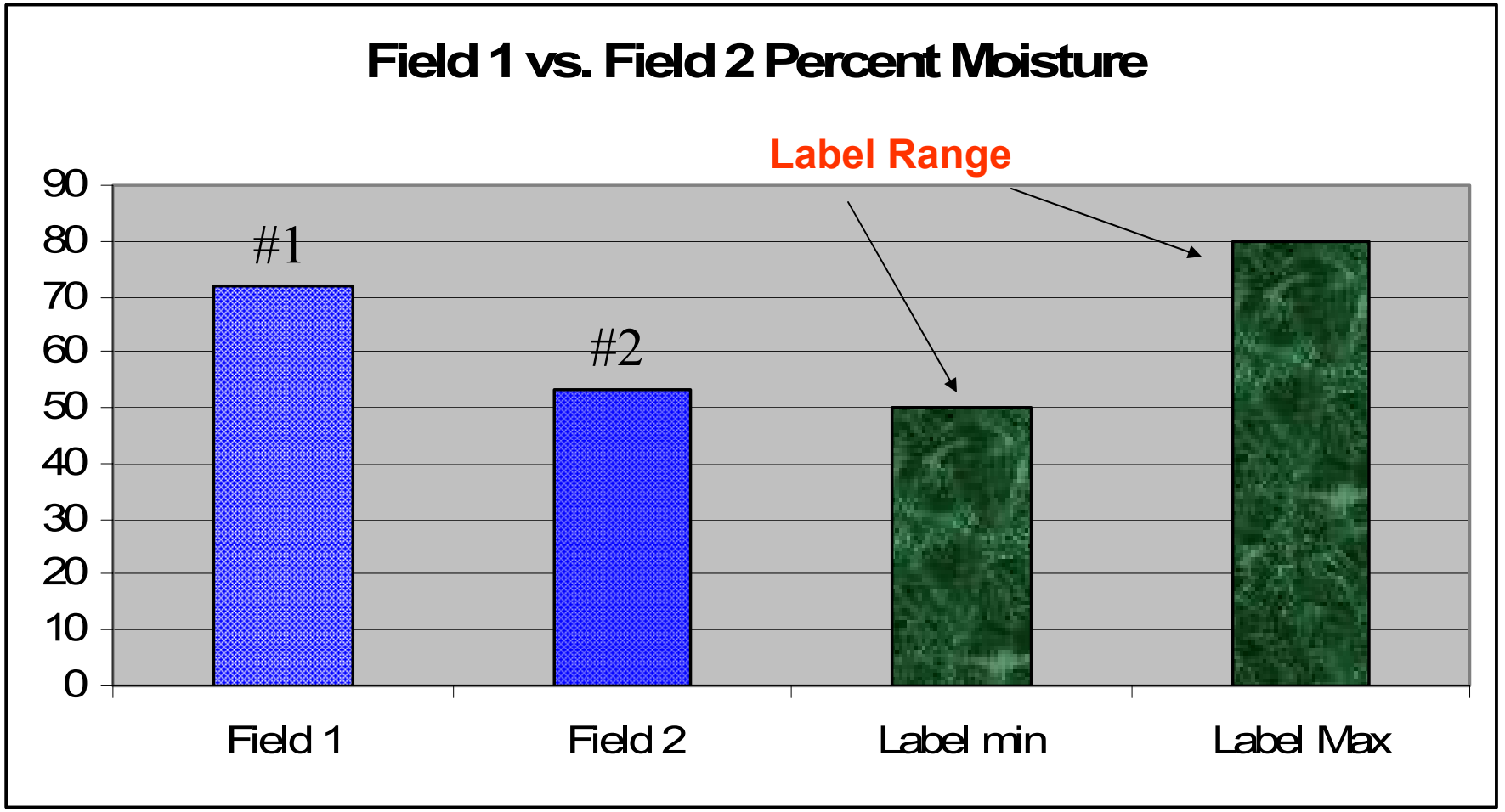


Higher emissions attributed to 59 % FC (Field 2) top inch vs. 70 % FC (Field 1)

Emission Results



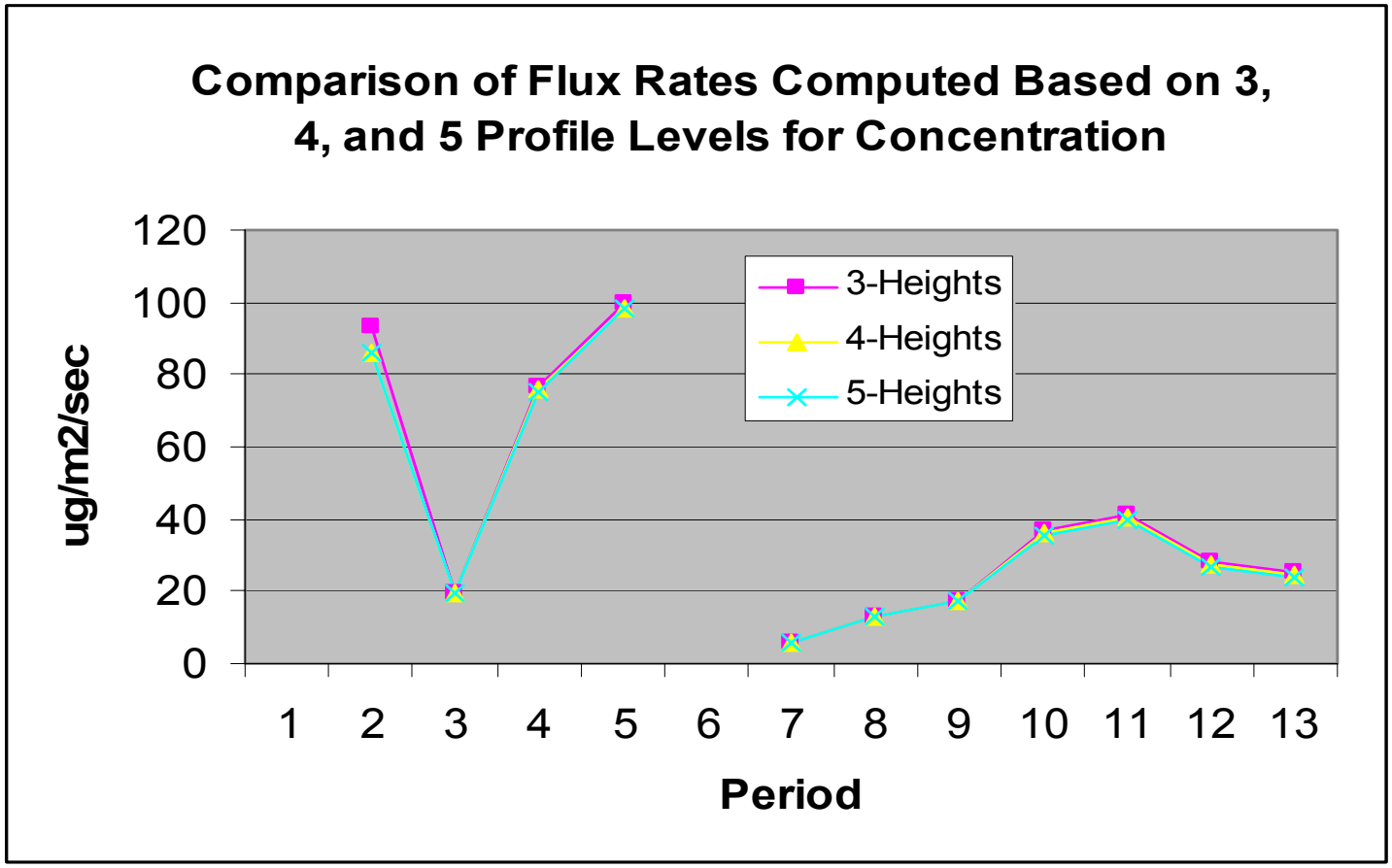
Moisture Differences Field #1 vs. Field #2



Design Implications of Latest Flux Studies

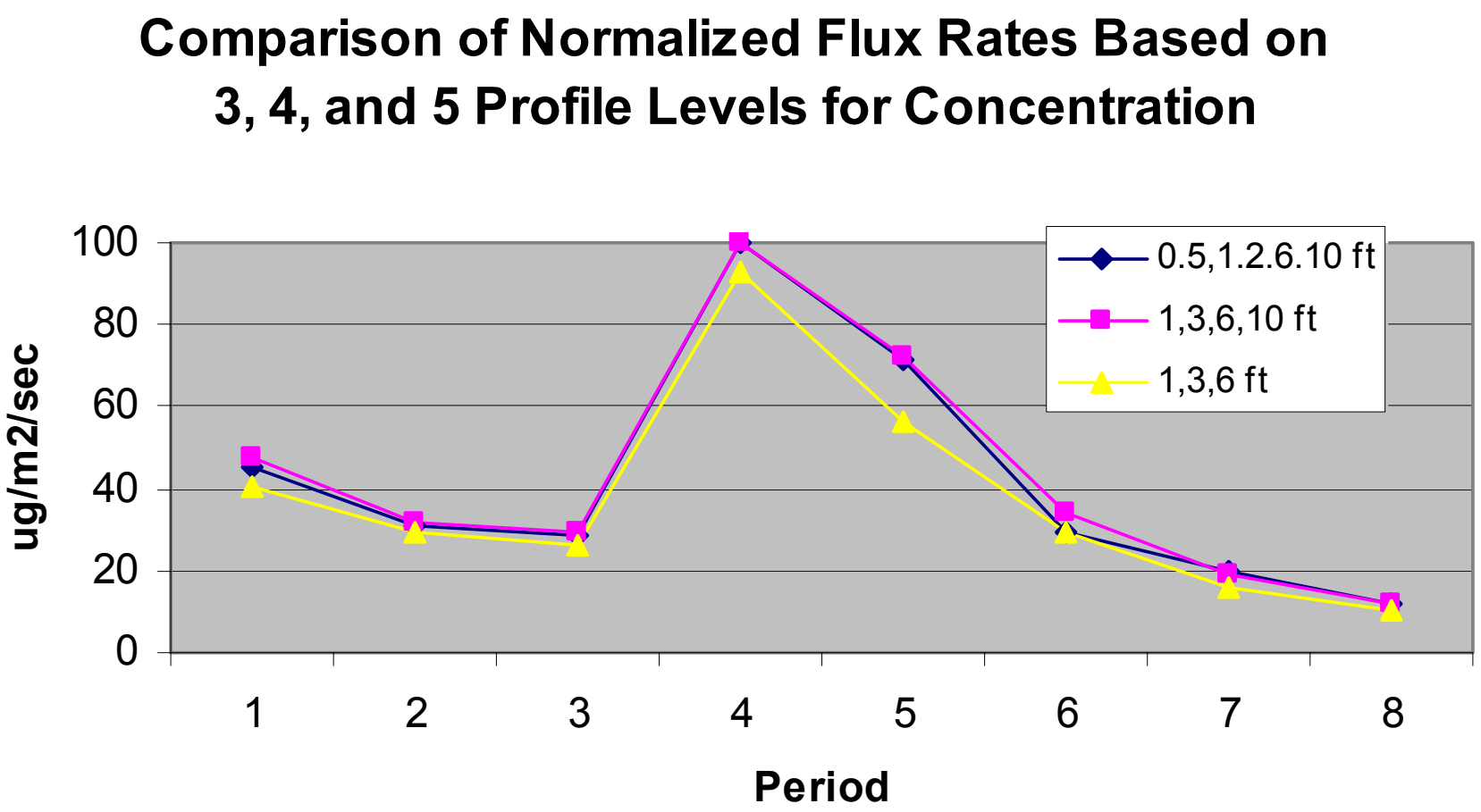
Simple step to 50 % more coverage

Comparison of Emissions Based on 3, 4, and 5-Level Profiles (Shank Study 2008)

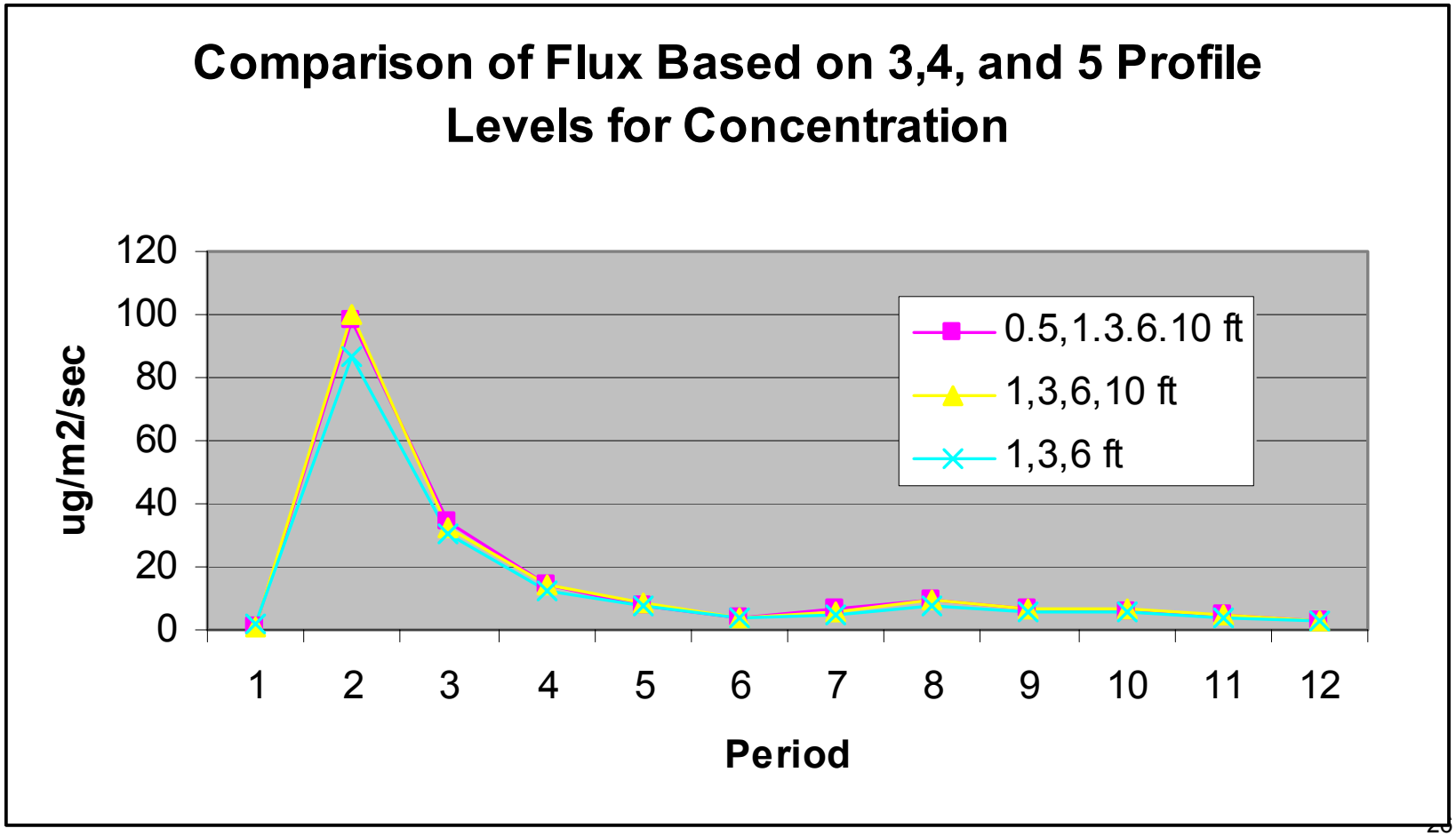


3rd Study showing 4 levels equivalent to 5

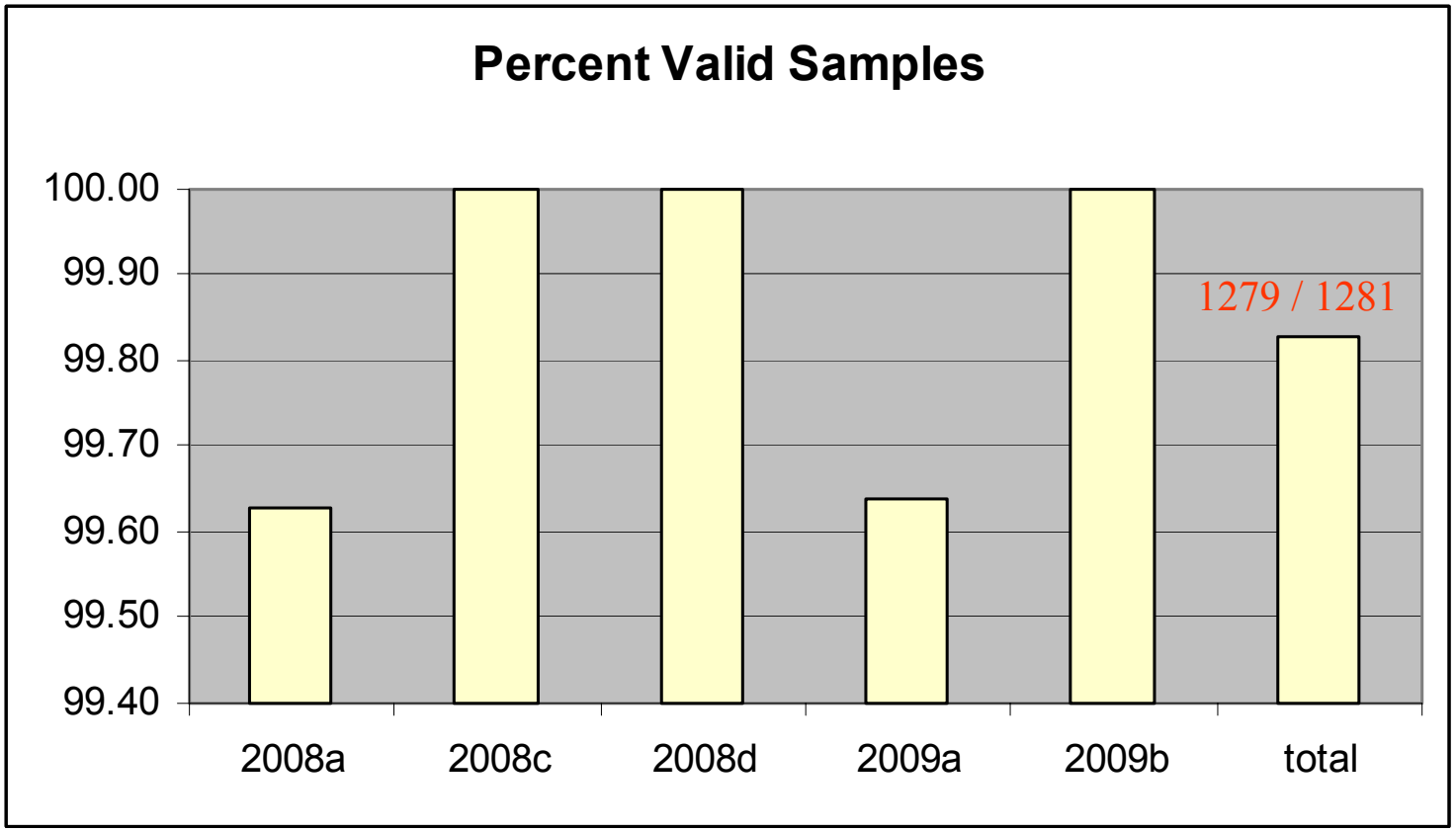
Example of Comparative Normalized Flux for 3,4, and 5 Profiles Levels from Other Field Study (#23)



Example of Comparative Normalized Flux for 3,4, and 5 Profiles Levels from Other Field Study (#24)



Risk of Losing 2 Samples in 1 Period in Well Managed Program?



ODDS = 1:640

2 in 1 period from 1 mast? < 1:1,000,000

Conclusions

- Shank / compaction dual seals very low emissions
- 4 level profile analysis is sufficient
  - Cover 3 concurrent treatments instead of 2
  - Risk of loss of coverage is negligible
  - Allows for consideration of uncertainty

END

Acknowledgements to study partners:

Dr. Husein Ajwa - - soil assessment & lab analysis

Ron Medrano - - application rig design

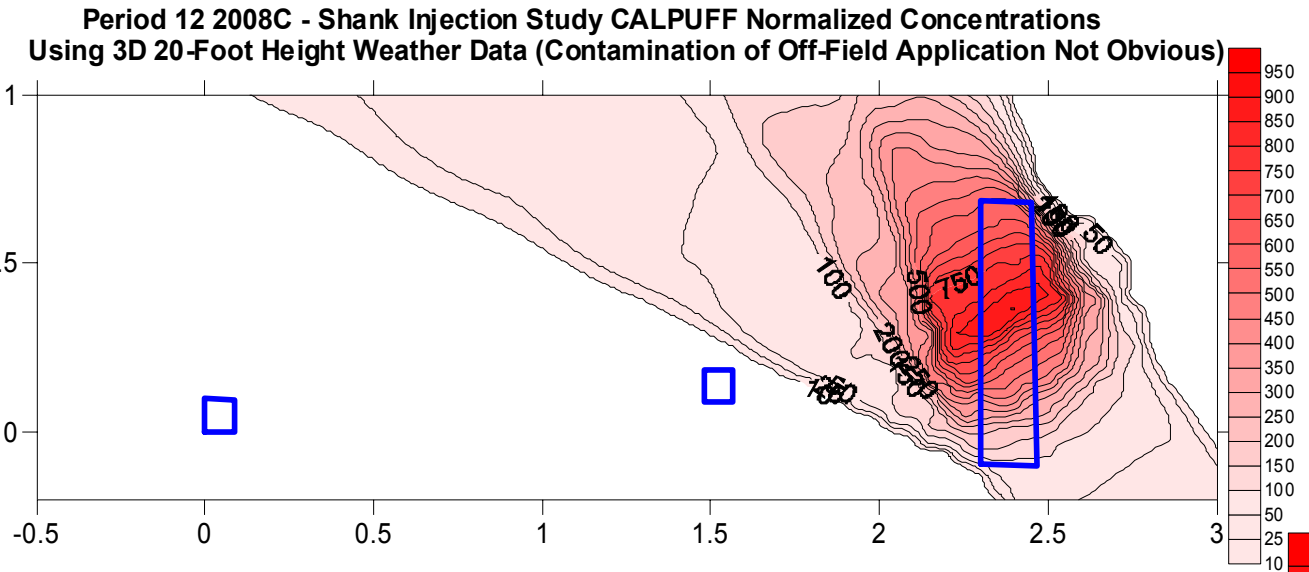
Kevin Pasco, John Guerard, Joe Voth - - Growers who have contributed a great deal to research over the years

Dr. Robert Thomassen, Brian Lange,, Jonathan Hunzie, and Ryan Sullivan - - Study Staff

20 Ft Wind Data Too High for Nocturnal Stable Conditions

(blue squares represents Field #1 and Field #2 - - affected Period 12 by large blue application)

20 ft winds



10 ft winds