Adapting Dispersion Software to DOE Standard 3009

Jorge Schulz and Thomas R. McDonnell
Bechtel National, Inc. / Hanford Tank Waste Treatment and Immobilization Plant (WTP)
jschulz@bechtel.com

Objective: Enable use of MACCS2 to generate 95th percentile overall atmospheric dispersion factors in accordance with the statistical treatment described in NRC Regulatory Guide 1.145 as required by DOE-STD-3009-94.

Relationship to DOE Safety Analysis Interests: Appendix A, section A.3.3, of DOE-STD-3009-94 states that the 95th percentile $\chi/Q$ should account for variations in distance to the site boundary as a function of direction and be consistent with the statistical treatment of $\chi/Q$ values described in regulatory position 3 of NRC Regulatory Guide 1.145. MACCS2 does not process the $\chi/Q$s consistent with Regulatory Guide 1.145. MACCS2 determines directionally independent $\chi/Q$s for different percentiles at a specific distance; thus, there is no way of obtaining the direction-dependent 95th percentile $\chi/Q$ without post-processing.

Results: The paper will outline the methodology in which MACCS2 expanded outputs for each hour of 10 years of site meteorological data and each distance interval were post-processed in an Excel spreadsheet. A spreadsheet was also used to independently validate the MACCS2 version 2.5 ATMOS module in accordance with DOE Quality Assurance Order DOE O 414.1C and Safety Software Guide DOE G 414.1-4.

In the course of this effort, two software errors were discovered in MACCS2. The first error was in the treatment of dispersion coefficients from a lookup table, and the second involved the method of accounting for plume meander. The paper will describe the errors and the evaluation that determined that the potential impact on existing WTP accident analyses is negligible.