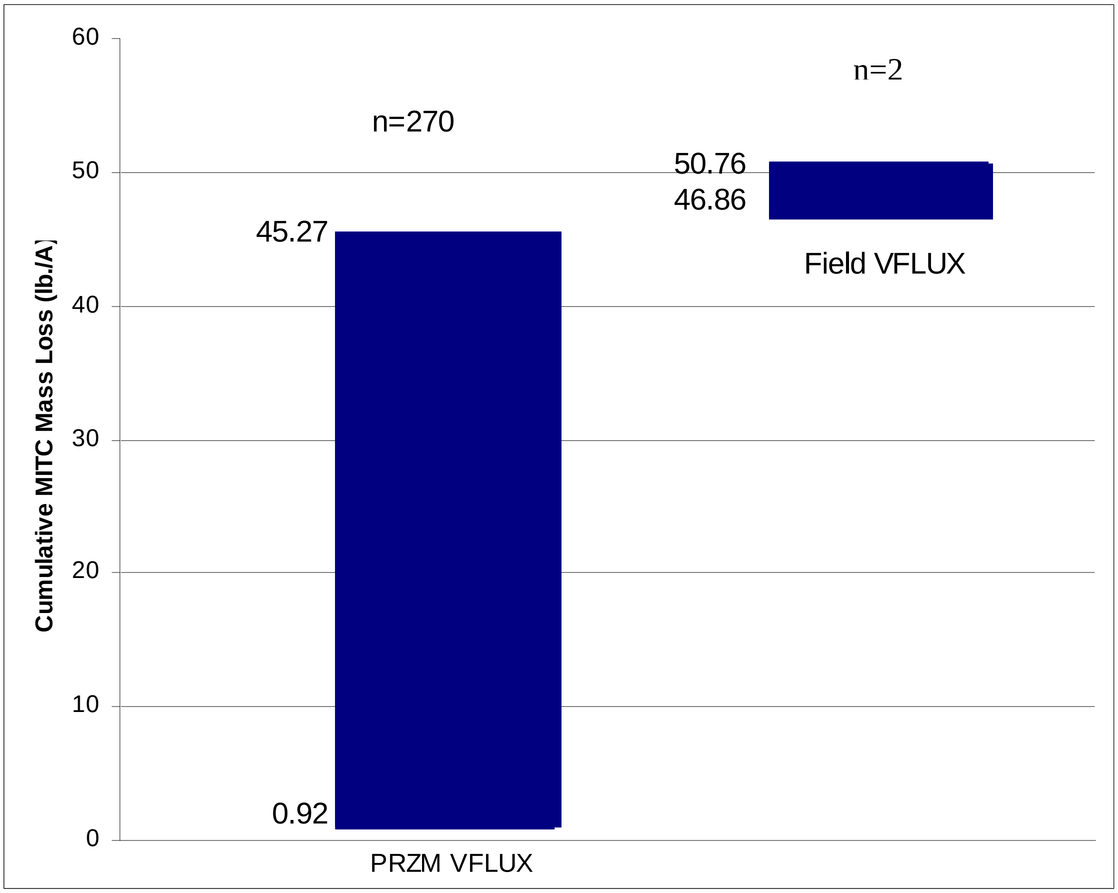
Appendix E – Evaluation of PRZM/EXAMS Volatility Algorithm

The EPA Office of Pesticide Programs (OPP) Environmental Fate and Effects Division (EFED) does not typically consider volatilization and subsequent loss from soil in its determination of pesticide loads to water bodies for conventional pesticides. However, the volatility algorithm is used in this risk assessment for MITC given its highly volatile characteristics. The PRZM/EXAMS model, which is used to arrive at estimated exposure concentrations (EECs) in surface water and benthic water pores, contains a volatility algorithm in soil and plant canopies in PRZM, but this volatility component has not been fully evaluated. Accounting for volatilization in aquatic exposure modeling will result in more defensible upper-bound EECs on the basis of the known physical chemical properties of the pesticide of interest, and will be consistent with any risk hypotheses indicating any air exposure route as potentially significant that is presented in the problem formulation of this risk assessment.

Since this risk assessment addresses exposure from a soil fumigant, only the soil volatility component is used. The enthalpy of vaporization and the Henry's Law Constant parameters control volatilization rates and the vapor-phase diffusion coefficient controls the dispersion of the gas through the soil. Volatilization flux through bare soil assumes simple diffusion through a boundary layer characterized by laminar flow and is calculated through the Jury equation in PRZM (EPA, 2005).

Figure E-1 below shows the comparison between ranges in modeled cumulative volatile flux rates from soil after modeled surface applications (PRZM VFLUX) and field measurements after surface applications (Field VFLUX). The maxima between the modeled and measured cumulative flux rates after applications were similar, with slight underprediction by PRZM, which in turn would contribute to conservativeness in resulting surface water EECs by PRZM/EXAMS. However, the minima between the modeled and measured cumulative flux were almost an order of magnitude different. One factor causing this discrepancy is that inherent to many field studies, there is often fewer datapoints as compared to that which is generated by a model. In this case, 270 modeled MITC flux rates were generated corresponding to 30 years of applications encompassing 9 crop scenarios in comparison to only two field volatility datasets each encompassing one application. Another factor which explains this discrepancy is that the Agency recommends in field volatility study protocol reviews that applications for the study occur during a time of year and day when conditions for volatility and resulting flux rates from soil are expected to be most ideal (e.g., high temperatures). Table 2-5 in the risk assessment shows that MITC field volatility studies associated with metam sodium surface applications took place during the late summer in the morning to early afternoon hours. These times correspond to the highest temperatures climatologically in California during the year, with daily maximum temperatures occurring within several hours after the applications are completed corresponding to when MITC loadings in the soil are also expected to be at maximum levels. Therefore, it follows that the field measured maximum flux rates are most comparable to modeled maximum flux rates as opposed to the minimum flux rates.

Figure E-1. Ranges between the maximum and minimum cumulative MITC flux rates for all modeled (left box) and monitored (right box) metam sodium surface applications.



Notes:

1. n value corresponds to number of applications.
2. Modeled cumulative flux encompassed 4 days after applications. Modeled flux rates were negligible after 4 days.