Current pencil beam models of electron dose distributions rely on broad beam central axis depth dose distributions. Off-axis beam characteristics generally assume truncated Gaussian distributions whose boundaries are defined by the field edges.We present a method, using measured values of the pencil beam spread parameter, to model the in-field fluence distribution in irregular electron fields as a 3-dimensional relative dose matrix. Relative fluence values at individual matrix points are calculated from measured lateral buildup ratios (LBR's) using a small reference field (2cm diameter). It is shown that this method accurately models dose distributions in small, irregular electron fields and provides the dual benefits of predicting dose distributions as well as output factor correction, which would normally have to be measured. This work will be compared with other approaches, including simple and modified Fermi-Eyges models of depth dose distributions, and two dimensional diffusion model, as used by the Theraplan treatment planning system.