I introduce the class of single species PVBS models defined on a finite, connected subset of $\mathbb{Z}^d$. I will give the finite volume ground states and provide a criterion for the dimension of the weak-* infinite volume ground state space that is dependent on the model parameters and the geometry of the infinite volume. Furthermore, I will show that the existence of the spectral gap in the thermodynamic limit depends on the model parameters and the geometry of the infinite volume to which we take the limit. (Received December 27, 2014)