Here we present a new case study on the use of cellular genetic signatures to determine whether or not a master cell bank (MCB) was derived from a single cell. The data examines the relationship between cell bank clonality, post-cloning cell heterogeneity, and the impact on process consistency. The cell line used to manufacture the master cell bank expressing mAb A was cloned using a method with probability of greater than 96%. The cell line contains a low level sequence variant that was exploited to examine the heterogeneity of the clonal cell line. Subclones were generated from the master cell bank and examined genetically by Southern analysis, copy number and sequence variant analysis. Results reveal the MCB is highly heterogeneous, but related to the parental cell bank confirming the likelihood that the MCB was generated from a single cell. Despite this, the heterogeneous bank performed consistently in a bioprocess across over generational age. Our results experimentally demonstrate the possible heterogeneity of a cell bank derived from a single cell, and its relationship to process consistency.