The primary objective of this study was to evaluate the performance of two selected chemical stabilization and solidification (S/S) techniques to treat three types of arsenic-contaminated wastes 1) chromated copper arsenate (CCA) wood treater waste, 2) La Trinidad Mine tailings, and 3) Montana soil. The goal was to determine the long term fate, including containment and rate of release in the three arsenic-contaminated samples. The leachability characteristics of the solidified arsenic wastes were determined under selected physical and chemical environments which are known to promote the release or leaching of arsenic. Sequential extractions of untreated and treated arsenic wastes were also conducted to study solid phase speciation of arsenic before and after stabilization. The results obtained from the sequential extractions were useful in directly assessing the potential mobility and bioavailability of the treated arsenic, as the mobility of arsenic is related to its solubility and decreases in the order of extraction sequence. Along with leachability studies, spectroscopic analysis were conducted to complement the results collected from the leaching tests. The spectroscopic analyses were used to determine the nature of the arsenic complexes and the arsenic bonding environment formed after treatment. X-ray absorption spectroscopy (XAS) data were analyzed using the computer program EXAFSPAK. XAS raw spectra were normalized using the Victorian function and spline-fitted to extract Extended X-ray Absorption Fine Structure (EXAFS) signals. Structural information for the sorption complexes was then determined by fitting the unknown spectra with non-linear least-squares methods, using phase and amplitude parameters. A cost analysis was also conducted to help formulate general conclusions about the use of S/S technology. The data collected were used to evaluate the effectiveness of both S/S techniques for the three types of arsenic-contaminated wastes.