Tailings storage facilities are geotechnically complicated structures that develop heterogeneous strength profiles and varied porewater conditions. The monitoring of porewater pressures is one of the only direct measurements that can be taken to monitor the performance of a facility throughout its life, and is of particular importance in upstream facilities. Foundation underdrainage, continuous tailings deposition, climate inputs (rain, snow, humidity, evaporation, etc), and stratified tailings' permeabilities can complicate this critical measurement, which introduces uncertainty to stability analyses. These difficult conditions manifest in vibrating wire piezometer measurements as very low or negative pressure readings, but which are within the instrument's range of accuracy; however, they are difficult to interpret and generally the most conservative interpretation is adopted. Where tailings are potentially liquefiable, these very low readings introduce further uncertainty regarding the pore space saturation ratio and liquefaction potential above the estimated phreatic surface. This area of uncertainty is the vadose zone and its effect of tailings behaviour is not well understood. This paper focuses on two case-histories of tailings dams in Australia, and the effects and challenges that this zone has had on their design, operation, and monitoring.