Application of selective non-catalytic reduction systems at municipal solid waste incinerators (MSWIs) often involves over-stoichiometric injection of ammonia into flue gases. Un-reacted ammonia may be deposited on fly ash particles and can ultimately influence the leaching behaviour of air-pollution-control (APC) residues. Batch tests were conducted to investigate the impacts of ammonia levels on leaching of a range of metals (sodium, potassium, calcium, aluminium, chromium, iron, lead, cadmium, copper, nickel and zinc), as well as chloride and dissolved organic carbon (DOC). Specific conductivity was also identified to reflect the soluble components. The results showed that with ammonia concentrations rising from a background level of 4 to 26,400 mg l\(^{-1}\), the specific conductivity increased by 2-7 times as pH varied from alkaline to acidic values. DOC release was also significantly enhanced with high ammonia levels of 1400 mg l\(^{-1}\) or higher at pH > 9; however at these high ammonia concentrations, the role of DOC in cadmium, copper, nickel and zinc leaching was negligible. Based on the experimental data, chloride, sodium and potassium were leached at high concentrations regardless of pH and ammonia concentrations. For aluminium, chromium, iron and lead, ammonia had little impact on their leaching behaviour. With respect to cadmium, copper, nickel and zinc, high ammonia concentrations significantly increased leaching in the pH range of 8-12 due to the formation of metal-ammonia complexes, which was also proved in the speciation calculations. However, the overall results suggest that typical levels of ammonia injection in MSWIs are not likely to affect metal leaching from APC residues.