

Arsenic speciation and mobility in Loddon River legacy gold deposits

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Many river catchments in Victoria were intensively mined during the Gold Rush (1850 – 1930), leading to wide-scale deposition of mine tailings and changes in river and floodplain geomorphology [1]. Our work has identified the presence of an arsenic-rich ‘plume’ in the tailing deposits overlying the original (i.e. pre-mining) floodplain surface in some of these rivers. Arsenic concentrations (> 500 mg/kg), exceeding the high level (70 mg/kg) interim sediment quality guidelines (ISQG) for Australian and New Zealand [2], indicate that As may pose a potential hazard to surrounding aquatic ecosystems.

The combination of sequential extraction, electron microprobe and XAS analyses was employed to understand the nature and the potential mobility of the As contamination within the tailings deposited in river banks along the Loddon River. Tailing deposits from Tullaroop Creek, a tributary of the Loddon River, were further examined to determine the conditions under which arsenic contained in these sediments may become more mobile. Specifically, a column experiment simulating reducing and oxidizing conditions was performed with the sediments to study the behaviour of arsenic and its interactions with iron, under wetting and drying conditions.

As these As-contaminated sediments are located on floodplains upstream of major reservoirs, this work will assist in the future management and understanding of the environmental risk presented by these tailings to surrounding aquatic ecosystems.

[1] Davis *et al.* (2018) *Anthropocene* **21**, 1-15

[2] Simpson *et al.* (2013) *CSIRO*, 132.