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Mobilisation of sediment-associated Pb from historical smelting and milling sites on the River Sheaf, Sheffield, UK

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Contaminated land investigation and historical studies have identified very high levels of soil Pb in a suburban (rather than industrial) area of the city of Sheffield, UK, which relate to smelting and milling activities in the 17^{th} and 18^{th} centuries. Although there is little contemporary evidence of this previous industrial activity, decontamination of residential gardens has been necessary. Floodplain soils on the River Sheaf, located downstream of these water-powered industrial sites, are also contaminated with high concentrations of Pb, suggesting that Pb has been mobilised from these contaminated sites. In order to investigate the spatial and temporal patterns of Pb mobilisation from the historical industrial sites, twelve mass flux samplers were deployed in the River Sheaf and its tributaries over two campaign periods (summer and winter), thus providing time integrated samples of suspended sediment. Mass flux samplers were located upstream and downstream of known contamination hotspots. Suspended sediments were characterised magnetically and subjected to Pb analysis. The mineral magnetic characteristics of the suspended sediments differentiates the summer and winter sampling periods, indicating the exploitation of different sediment sources during convective summer storm events. The mineral magnetic properties and Pb content of suspended sediments also vary spatially in relation to the location of former industrial sites. Mobilisation of legacy pollutants from soils to fluvial systems represents a contemporary threat to water quality. Understanding spatial and temporal variations of sediment-associated heavy metal contamination of urban and suburban river basins is necessary for their successful management.