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Uranium and Its Decay Products in Floodplain Sediments from the River Fal,

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European river basins are subject to longer-term storage of legacy contaminants in sedimentary sinks and their potential release presents a credible risk to achieving water quality targets required by the EU Water Framework Directive. The catchment of the River Fal, south west England, is extensively mineralised and has been greatly impacted by heavy metal mining. Uranium and radium were extracted and processed between 1870 and 1930 and spoil tips along the channel banks are assumed to have been a source of radionuclides into the river. Radionuclides were determined in five cores obtained from the river floodplain, including a reference core positioned upstream of the uranium mine enabling evaluation of its impact on past and contemporary sediment quality. The core was sectioned into 1 cm thick slices and they were analysed by gamma spectrometry for products of the U-238 decay series, i.e. Th-234 (a surrogate for U-238), Pb-214 (a surrogate for Ra-226), Pb-210 and fallout Am-241 and Cs-137. Peak Cs-137 concentrations at mid-depth were associated with fallout after atmospheric nuclear tests in 1963 and were used to estimate sedimentation rates. However, the activity concentrations of Pb-210 were elevated at all depths and the result indicated a significant input of unsupported Pb-210 (linked to processed spoil material) throughout the period of deposition. At some sites, peak activity concentrations of Th-234 suggested inputs from mining activity during major release and/or flood events. The cores downstream of the mine all had higher radionuclide inventories, of the order 10^5 Bq m^{-2}, compared to the reference core due to the presences of products from the U-238 decay series. In addition, the inventories did not decrease systematically downstream indicating storage regions within the river channel. Storage of such legacy contaminants at levels in excess of contemporary environmental quality guidelines raises important questions and challenges for floodplain use and management.