

A study of metals in sediments of the Forth and Clyde Canal, Scotland, UK

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The Forth and Clyde Canal was constructed during the industrial revolution as a short, internal transport route connecting the west and east coasts of Scotland. Its course flows through urban and rural areas, and it has been impacted by varied inputs of potentially toxic elements (PTEs) throughout its history.

Twenty-eight sediment samples were obtained from the canal, with sampling points approximately 2 km apart, and another 3 along a short branch-canal leading close to Glasgow City Centre. Pseudo-total (aqua regia soluble) contents of the PTEs As, Cd, Cr, Cu, Fe, Mn, Ni, Pb, Sn and Zn were measured in the samples using inductively coupled plasma mass spectrometry (Agilent 7700 Series) following microwave-assisted aqua regia digestion (CEM MARSXpress™ system). Results were compared with data obtained by British Waterways in 1992 [1], and with environmental quality standards (EQS).

Concentrations of Fe averaged around 5.5% (w/w) and of Mn ca.1500 µg/g. The general urban pollutants Zn and Cu were found distributed all along the canal, with levels of Zn averaging 1200 µg/g and levels of Cu averaging 200 µg/g. Cd was not detected in 5 sites along the Forth and Clyde Canal, and where detected, levels

were just above the limit of detection of 0.014 µg/g. Pb levels were overall highest, exceeding 2500 µg/g at one point. Levels of As, Cr, Ni and Sn ranged from <100 µg/g to ca. 1000 µg/g. The general trend observed was that present PTE levels are lower than those determined in 1992; which is probably due to routine dredging and sediment disposal, but still higher than EQS values.

The modified BCR sequential extraction protocol [2] was then applied to fractionate the PTE content and provide information on the potential mobility, bioavailability and toxicity of the PTEs present.

This contribution summarises the result of the study and provides an indication of which PTEs have greatest potential environmental impact within the canal system.

References

- [1] National Sediment Sampling Scheme - Report on the Sediment Quality in British Waterways Canals and Navigations, Scotland Unpublished internal report, 1992
- [2] G. Rauret, J.F. Lopez-Sanchez, A. Sahuquillo, R. Rubio, C. Davidson, A. Ure, Ph Quevauviller, J. Environ. Monit. 1 (1999) 57.

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