

Lessons from pilot-scale sediment reuse projects on the Scottish canal network.

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Introduction:

Beneficial reuse of dredged sediment from canals, harbors, and waterways would appear to be a straightforward opportunity to transform a waste product into a valuable resource, in line with developing a circular economy. In practice there are multiple technical, regulatory, and economic barriers to their beneficial reuse. Two pilot studies were undertaken in Scotland in conjunction with scheduled maintenance dredging on the Scottish canal network to investigate the practical difficulties to sediment reuse on a 1,000 – 15,000 m³ scale.

Pilot sites:

Projects were undertaken on the Forth and Clyde Canal at Bowling, Dumbartonshire and on the Caledonian Canal at Laggan, Highland Region. At Bowling, sediment characteristics favored reuse as a topsoil following bio-conditioning in a cell constructed for this pilot. After only 5 months in this cell, samples met the specifications of BS 3882:2015 and was suitable for landscaping on an adjacent construction site.



Fig.1: Suction dredging on the Caledonian Canal.

By virtue of its location within a steep valley and the underlying geology, sediment entering the Caledonian Canal is granularly coarser than that of lowland canals. Consequently, dredged sediment from

this canal was better suited to reuse as aggregates and as components for concrete. At Laggan, suction dredging (Fig. 1) was used to remove over 8,500 m³ of material, which was delivered as a slurry to a series of lagoons. As the slurry washed through the lagoons, sediment particles were separated by gravity resulting in clean sand, with gravel fractions removed by screening.

Sand and gravel fractions were mixed with Portland cement to manufacture two tonne concrete blocks for erosion control. The residual silty deposit in the lower cell met the criteria for topsoil and was used to restore the site to its original grade. Meanwhile, sand in the upper lagoon (Fig 2) contained <10 % of <0.063 mm, so met the requirements for reuse as fine aggregate in asphalt (BS EN 13043:2002).



Fig. 2: Sediment segregation within lagoons.

Conclusions:

The pilot studies demonstrated the viability of reusing dredged sediments for infrastructure projects. However, they highlighted the importance of minimizing transportation and handling of wet sediment to the viability of sediment reuse.