Evaluation of Peat Sorption Media for Metal Removal from Stormwater from a Mineral Processing Facility[1]

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Abstract: Peat has been used in passive and semi-passive systems designed to treat mine drainage, industrial storm water and other wastewater where trace metal concentrations are above regulatory limits. Peat is known for its natural ability to remove metals through multiple mechanisms, including ion-exchange, surface adsorption, and complexation but has a low hydraulic conductivity. American Peat Technology® (APT) developed a patented process whereby reed-sedge peat is converted into a hardened granular sorption media. The hardened granule maintains the natural ability of the peat to remove both suspended and dissolved metals and increases the hydraulic conductivity of the media to about 0.5 cm/sec, comparable to coarse sand. The purpose of this study was to evaluate removal of zinc (Zn), cadmium (Cd) and lead (Pb) from stormwater obtained from a mineral processing facility using peat media in a laboratory-scale up-flow column. Influent concentrations of Zn (6814 µg/L), Cd (153 µg/L) and Pb (177.1 ug/L) were initially reduced by up to 98.88%, 99.92%, and 98.93%, respectively. By the end of the run, initially high removal of Zn gradually decreased to about 50% and Pb removal remained around 99% throughout. Cd removal decreased to 78.05% by the end of the run. The column treated over 1300 bed volumes of water in a 7-day period. At the end of the run the column was divided into 4 sections and the media was analyzed. Metal concentrations in the media were highest near the inlet and decreased with distance. Maximum zinc concentration in the media approached 2%. Mass balance calculations were done on both the mass accumulated in the media and the mass removed from the influent; estimates were within 12%.[3]

Additional Key Words: zinc, cadmium, lead, ion-exchange, complexation, adsorption, mass balance.

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3. Work reported here was conducted near 44.0474° N, 91.6433° W.