

to determine the fate of sludge after it has been applied to the waste rock and infiltrated below the surface.

Electromagnetic (EM) surveys were first used over parts of the Fire Road mine in 2000 as part of a UNB field school in environmental geoscience. One unanticipated result was the observation of elevated electrical conductivities in an area that had previously been used for sludge disposal. The possibility of using electrical conductivity as a tracer to track sludge migration within the waste rock motivated NB Coal to sponsor the acquisition of an EM apparent conductivity survey over the entire backfilled cut. Results of that survey, conducted in 2004, show that the conductivity structure is highly heterogeneous but exhibits many well-defined trends and anomalies. A long, linear conductivity high, located along the high wall of the mine, is attributed to pooling of mine water and higher porosities in that zone. Other conductivity highs are clearly associated with historical patterns of sludge application and its subsurface migration. The presence of moist, conductive sludge filling void space in the waste rock above the water table may explain this association. If so, apparent conductivity mapping may reveal which parts of the mine site would benefit most from the application of sludge for purposes of reducing the infiltration of oxygen and production of AMD.

Laboratory experiments are currently underway to measure the electrical conductivity of the sludge relative to the mine water, and its dependence on moisture content. Knowledge of these physical properties will help us to refine interpretations of apparent conductivity and resistivity surveys acquired in the field.

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### Apparent conductivity mapping of sludge migration through waste rock at Fire Road Mine, Minto, NB

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The relocation of mine water neutralization sludge from settling ponds to the acid-generating waste rock could provide several benefits for reclamation of abandoned coal mines. These include a low cost final disposal area for the sludge and a minimization of land disturbance for sludge disposal purposes, as well as a reduction in the diffusion of oxygen into the waste rock with and a corresponding reduction in the generation of acid mine drainage (AMD). NB Coal had been depositing lime neutralization sludge from its mine water treatment plant back onto the waste rock at the backfilled Fire Road strip mine since 1992. Chemical investigations have identified a decrease in the mine water acidity and iron and aluminum concentrations, which may be in part due to the application of the sludge. To date, however, there has been no way apart from trenching,