

GIS-based map modelling using the weights of evidence method applied to acid rock drainage prediction in the Meguma Supergroup, Nova Scotia

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GIS-based map modelling involves the integration of input data layers (maps) by various techniques to derive a final output map showing either locations that satisfy a certain set of criteria, or areas of potential (generally ranked from high to low). The objective of this study is to produce a regional-scale output map of an area in the Meguma Supergroup of Nova Scotia that shows the potential to produce acid rock drainage (ARD) if the bedrock is exposed to surface oxidizing conditions. The integration method used is weights of evidence modelling which is an objective, data-driven technique that uses the location of known points (in this case, sulphide mineral occurrences) to calculate weights (W^+ and W^-) for each input map. The weights are then used to calculate an output map of posterior probability indicating ARD potential.

Five digital maps including geology, regional metamorphism, proximity to anticlines, proximity to the

Goldenville-Halifax transition zone (GHT), and vertical gradient magnetics were used as input layers of evidence. Weights for each input map were calculated using the location of over one hundred sulphide mineral occurrences. Three of the input maps (proximity to anticlines, proximity to GHT, and vertical gradient magnetics) were optimized in order to maximize the spatial association between sulphide mineral occurrences and the predictor pattern of each map. The resulting output map shows areas most favourable and least favourable for the development of ARD. Such maps can be used as a "first pass" indication of possible ARD areas and would be particularly useful in the initial planning stages of major construction activities such as highway construction. Also, when the results of such maps are combined with the results of other ARD prediction techniques including acid base accounting and detailed mineralogical studies, areas where ARD is likely to occur can be accurately predicted.