

# SEG 2024 Conference: Sustainable Mineral Exploration and Development

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## Mineral Prospectivity Mapping for Porphyry Copper-Gold Mineralization Style Using Fuzzy Logic Method in the Arthurs Seat Project, Jamaica

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The Arthurs Seat project lies in one of the “Central Inliers” of Cretaceous rocks in Jamaica, approximately 45 km northwest of Kingston. The project area is overlain by Lower Cretaceous conglomerates, volcanic breccias, intercalated ash, and crystal tuffs and andesitic to basaltic andesite lava flows rocks of the Arthurs Seat Formation. The Upper Cretaceous comprises a sequence of limestone, limestone-siltstone, siltstone, andesite-tuff, conglomerate, and limestone rocks of Peters Hill, Black River, Dawburn Content, Main Ridge, Slippery Rock, and Guinea Corn Formation. The Cretaceous rocks are covered by Eocene sandstone, sandstone-limestone, limestone of the Lichfield, Chapelton, and Troy Formations.

The Fuzzy Logic method was successfully used to map areas of Cu-Au porphyry mineralization potential in the Arthurs Seat project. Proximity to geological features is transformed into fuzzy membership functions based upon qualitative and quantitative knowledge of spatial associations between known Cu-Au porphyry occurrences and geological features in the area. Through this approach, favourable lithologies, geophysical, structural, and geochemical criteria were integrated into a prospectivity map. The most favorable lithologies are the intrusive rocks hosted by Arthurs Seat formation. Total Magnetic Intensity Reduced to Pole was used to map circular features, and First Derivative of Total Magnetic Intensity Reduced to Pole combined with factual faults was used to map lineaments. Soil data was leveled by formation to apply Principal Component Analysis (PCA). Five blind porphyry Cu-Au targets were identified in the Arthurs Seat project and were validated by mineral occurrences in rock chip samples greater than 1% in Cu.