

Graphite Prospecting Using a Ground-Based Time-Domain Electromagnetic System

E. Meunier¹, M. Cunningham¹, J-C. Ricard², C. Samson¹

¹Department of Earth Sciences, Carleton University, Ottawa, ON, Canada; ²Devbrio Géophysique Inc, Gatineau, QC, Canada

Abstract

Graphite is a mineral that plays an important role in the iron and steel industry, the automotive industry, and in emerging technologies. The industrial demand for graphite has been growing at a rate of about 5 per cent per annum in recent years and the carbon and graphite market is expected to reach US \$ 7.5 Billion by 2015. Graphite is most often formed in metamorphic environments under reducing conditions, where carbon materials are converted into crystalline graphite under high temperature and pressure. It has a high electrical conductivity, which makes it a good target for electromagnetic (EM) surveys. Airborne EM surveys can detect large graphite deposits; however the footprint of the systems is usually too large to see smaller graphite deposits. These smaller deposits can be detected by induced polarization (IP) surveys, but these surveys are laborious and expensive. The IMAGEM system is a new ground-based time-domain EM (TDEM) survey system with sufficiently high resolution to detect small conductive targets, such as graphite bodies. The system is battery powered and can detect anomalies as small as half a meter in size. The system operates continuously at a sampling frequency of 105,000 Hz while being towed by vehicle or carried by foot by two operators. It also supports real-time audio feedback based on the conductivity being measured, giving the lead operator a greater awareness of the areas of high conductivity as the survey is being conducted. We present a case study where the IMAGEM system was used to survey a known graphite deposit located approximately 140 km north of Montreal, Quebec. The IMAGEM system demonstrates a higher spatial resolution than the airborne TDEM survey previously conducted on the property, which makes it an effective tool to follow-up targets identified during airborne surveys for optimal drilling site selection.