Executive Summary (300 words)

Please describe using language understandable by a non-expert:

- The nature of the problem the project addressed
- Goals achieved
- Any positive outcomes from the project, including:
  papers published, patents obtained, any benefits to the company (improvements, cost-savings, new / improved technologies or processes developed) and whether the intern was hired afterwards

Geophysical inversion is the mathematical process of recovering a physical-property distribution within the earth from a set of observed data. One major aspect of inversion is the problem of non-uniqueness; there are an infinite number of possible mathematical solutions that can reproduce the observed data. The most common way of resolving this issue is the addition of regularization, which in general defines how the model should vary globally (e. g., smoothly).

The presence of geology data such as drill-hole information, maps, and petrophysical surface examples often gives geologists an idea of the sub-surface distribution. However, the incorporation of these data types into geophysical inversion is desirable. The vehicle through which this incorporation is done is through regularization and bounded property constraints. Unfortunately, the practicality of such methods can be difficult to overcome.

The intern has developed algorithms to feasibly merge geologic data with geophysical inversions quickly. Further, a graphical user interface and program has been written to add the work seamlessly into an existing software package used by industry sponsors. This gives both geophysicists and geologists the capability to add supporting data to their inversions reducing time and cost of exploration. Perhaps more importantly, the influence of these data on the inversion will produce more reliable results than that of common regularization methods.

Although the intern has not been hired, his future work focusing on the sophistication of regularization and constraints derived from existing geological models will bring this work to fruition. Specifically, parametric inversion will be utilized to determine the degree of smoothness over each rock property boundary rather than a global measure.

By signing below I agree that the information contained in this Final Report is an accurate reflection of this Mitacs-Accelerate Internship. I understand that Mitacs may share the Executive Summary portion of this document with government funding agencies, partners, and prospective partners of the Mitacs-Accelerate Program.

Intern Signature

Supervisor Signature

Organization Partner Signature