DEVELOPMENT OF ENHANCED TECHNOLOGIES FOR REMEDIATION OF PETROLEUM-CONTAMINATED SITES IN WESTERN CANADA

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EXECUTIVE SUMMARY

Soil and groundwater contamination at petroleum-related sites is acquiring more and more attention by the public and governments as well as petroleum industries themselves. The contamination can lead to a variety of impacts and risks to the communities and for the industries themselves. For example, one gallon of leaking gasoline can render one million gallons of water unsuitable for drinking, while about 10% of the 200,000 underground storage tanks in Canada are leaking and contaminating the surrounding environment, causing losses of thousands of dollars yearly to petroleum industries. For example, oil and gas production in Alberta and Saskatchewan accounts for more than 1500 kt of hydrocarbon emission to the environment. It was estimated that Saskatchewan has about 500 abandoned refineries and service sites that are contaminated. Consequently, it is desired that effective remediation approaches with sound environmental and economic efficiencies be identified.

A variety of remediation technologies have been used for cleaning up petroleum-contaminated sites. Previously, there were studies on individual problems and/or processes related to site remediation practices using biological measures within a Canadian context. However, most of the previous efforts were dedicated to one or few existing biological remediation technologies for the purposes of problem solving and/or consulting. There were very few in-depth R&D on innovative technologies that are suitable to the western Canada context. In most of the previous projects, people tended to (a) use simple and available technologies even for complicated problems, (b) promote the

available technologies which they have in hand (with relatively narrow scopes), and (c) over-design remediation systems to make their jobs easier and protect themselves (due mainly to the lack of confidence on the adopted technologies). Since natural conditions in Canada are different from other parts of the world, none of the existing remediation technologies is directly suitable under many situations. This research will focus on the development of innovative enhanced remediation technologies and the application of them to western Canadian cases, in order to obtain improved cost-effectiveness and efficiencies.

This report is organized into two parts, where part one emphasizes on the development of a biosparging system with pulsed air injection, and part two is about the initiation of an innovative technology for air stripping with electromagnetic-vibration enhancement.