

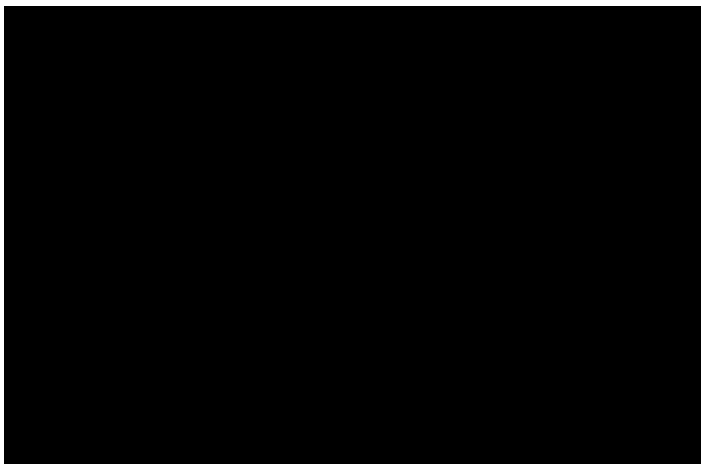
ROCK REMOVAL UTILIZING ICE BRIDGES IN THE MACKENZIE RIVER NORTHWEST TERRITORIES, FOR PIPELINE TRENCHES TO MAN-MADE ISLANDS A DEEPENING SHIPPING CHANNELS

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ABSTRACT

For more than 60 years, ESSO RESOURCES CANADA LIMITED has been producing and refining oil at a small refinery in Norman Wells, Northwest Territories, and supplying diesel fuel and other oil products to northern markets. In 1982, ESSO was granted governmental approval to expand production from the oil field from 475 cubic metres a day to 4400 cubic metres a day. This \$800,000,000 project proceeded ahead of schedule for a start up in 1985.

In expanding the Norman Wells operation, contractors had to overcome many of the challenges inherent in undertaking development in such a harsh northern climate and remote location. These challenges included the lack of site specific design data, logistics constraints, complex pipelining underwater and through permafrost.



Norman Wells, a town of about 400 people, is located on the banks of the Mackenzie River about 100 km south of the Arctic Circle. The Mackenzie, the second longest river in North America, is about 4 km wide at Norman Wells. Two natural islands, Goose Island and Bear Island, are situated in the river near the townsite. Most of the oil field lies under the river, which freezes over in the winter.