The Geo Engineering Centre

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RESEARCH SUMMARY

HYDRAULIC FRACTURE EXPERIMENTS IN SAND

MEASURED MAXIMUM MUD PRESSURE CAUSING MUD LOSS

MEASURED GROUND SURFACE DEFORMATION DUE TO MUD FLOW

QUANTIFIED MUDCAKE PROPERTIES IN UNIFORM SAND

EXAMINED PERFORMANCE OF CAVITY EXPANSION THEORIES

FINITE ELEMENT ANALYSIS USED TO ESTIMATE PEAK MUD PRESSURE

HIGHLIGHTS

- **Presentation on measurements of maximum mud pressure at International No Dig conference in Toronto (2009)**
- **Measurements of ground surface movement confirm poor performance of finite element analysis**
- **Position with Thurber Engineering in Toronto**

EXPERIMENTS EXAMINING MUD LOSS DURING DIRECTIONAL DRILLING

To create a route for a new pipe, horizontal directional drilling uses drilling mud to stabilize the borehole, remove the soil cuttings, cool the drilling bit, and lubricate the new pipe as it is pulled back into the borehole. However, if the pressure of the drilling mud becomes too large, it can cause tensile fracture in the soil or unconfined plastic flow, which leads to mud movement through the soil out to the ground surface.

Consultants use an equation developed considering cavity expansion of the borehole to prevent blowout of the soil during the drilling process. However, there has been no test data for use in assessing the available methods for estimating maximum mud pressure.

David in 2007 performing hydrofracture experiments using the small buried pipe test cell.

David designed and conducted both small scale and large scale laboratory tests to develop seminal data for assessment of the mud pressure models.

NASTT STUDENT POSTER COMPETITION, SAN DIEGO

David and Hongwei Xia presented a poster at the 2007 No-Dig conference in San Diego. The work described their tests of hydrofracture in sand. The poster was voted runner up in the NASTT student poster competition.

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Ground surface after hydrofracturing in the large scale laboratory tests