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Invitation

The 39th Annual Michael Bozozuk Student Forum

Date:	**Wednesday, March 4, 2015**
Time:	**Reception 17:30 to 18:00 hrs**
	Presentations Begin 18:00 hrs
Location:	**324 Ellis Hall, Queen's University, Kingston**
Admission:	**Free**
RSVP:	**Ioannis Vazaios (Ioannis.vazaios87@gmail.com) by Monday March 2, 2015**

Student Finalists

Queen's University: **Ms. Amy Rentz**
Title: **Field performance of exposed geosynthetic composite liner systems: down-slope bentonite erosion from a geosynthetic clay liner (GCL)**

Royal Military College: **Mr. Brad Forbes**
Title: **The application of distributed optical sensing for monitoring temporary support members**

Carleton University: **Ms. Elizaveta Rozina**
Title: **Dewatering in a laboratory simulation of in-line flocculated oil sands tailings**

Ottawa University: **Mr. Zhong Han**
Title: **A Unified Model for Predicting the Stiffness and Shear Strength of Unsaturated Soils**

Congratulations on Representing your Respective Universities!

Queen's University: Ms. Amy Rentz

Title: **Field performance of exposed geosynthetic composite liner systems: down-slope bentonite erosion from a geosynthetic clay liner (GCL)**

Bio:

Ms. Amy Rentz received her Bachelor of Science degree in civil engineering from Queen's University. She is currently a PhD Candidate at Queen's University working under the supervision of Dr. Richard Brachman, Dr. Kerry Rowe and Dr. Andy Take. Her research is focused on geosynthetic composite liner systems and how they perform when left exposed in the field.

Abstract:

It is common for a geomembrane (GMB), generally black, and a geosynthetic clay liner (GCL) to be used in combination as a low hydraulic conductivity composite liner system. These composite liner systems have been widely used as municipal solid waste landfill barriers for the past two decades and are now increasing in popularity as a liner system in mining applications. They have proven to be effective leakage barriers to contaminants when the manufacturers' recommendations for installation and quality control procedures have been followed including timely covering of the composite liner with cover soil. However, it is not uncommon in some jurisdictions in North America and elsewhere for GMB/GCL composite liners to be left exposed to solar energy for weeks, months, even years after installation as the result of operational and/or cost considerations.

Leaving these composite liners uncovered and exposed to solar energy has been reported to degrade the effectiveness of the composite barrier system through three different mechanisms. It is now well recognized that significant daily variations in geomembrane surface temperatures lead to thermal expansion, buckling of the geomembrane, and the creation of networks of wrinkles that pose a risk of higher leakage rates due to poor contact between the geomembrane and underlying GCL. Prolonged solar exposure also drives GCL moisture cycles which have been observed to result in the accumulation of irrecoverable shrinkage strains in the GCL, GCL panel shrinkage, and the potential loss of panel overlap. A third negative implication of prolonged solar exposure relates to the newly identified mechanism of down-slope bentonite erosion from a GCL, recently observed during the first Queen's University Environmental Liner Test Site (QUELTS I) experiment.

This presentation will summarize the findings from a second QUELTS II study, where the objective was to quantify the onset and progression of down-slope bentonite erosion for one type of GCL beneath a black geomembrane.

Royal Military College of Canada: Mr. Brad Forbes

Title: **The application of distributed optical sensing for monitoring temporary support members**

Bio:

Mr. Brad Forbes is current graduate student at the GeoEngineering Centre, Queen's-RMC. He is currently a Masters student working under the supervision of Dr. Nicholas Vlachopoulos and Dr. Mark Diederichs. Brad completed his undergraduate degree in mechanical engineering at Queen's University and has four years of experience developing geotechnical instrumentation at YieldPoint Inc. in Kingston ON. The focus of Brad's research is on improving the current understanding of the distinct performance of temporary support elements (e.g. rock bolts, forepoles, steel-sets) in isolation and their performance as part of a multi-component system.

Abstract:

An observational approach to tunnel design and construction is commonly employed in order to assess excavation driven displacements which, in turn, affect temporary tunnel support design decisions. The current monitoring practice is often limited to capturing the inner profile of the excavation and conditions at surface (e.g. geodetic monitoring). However, insight into the behaviour and state of temporary support elements, installed in order to mitigate and control excess deformation during tunnel development, can undoubtedly provide pertinent information for optimizing the tunnelling process. Within this context a novel application of a distributed optical strain technology combined with steel support elements is presented. The development of the optical technique as well as the results of laboratory experiments will be highlighted upon. Furthermore the potential for such a technique to be used as tool with the capability to "see" and "sense" into the ground ahead of the working face will be discussed.

Carleton University: Ms. Elizaveta Rozina

Title: **Dewatering in a laboratory simulation of in-line flocculated oil sands tailings**

Bio:

Elizaveta is currently pursuing studies in a Masters of Applied Science (M.A.Sc.) at Carleton University under the supervision of Professor Paul Simms. She completed her Undergraduate bachelor's in civil engineering with a co-op designation at Carleton University in April 2013 with High Distinction. Her specialization is in geotechnical engineering. Her thesis is focused on the dewatering behaviour and bearing capacity of oil sand tailings deposits.

Abstract:

The oil sands industry is exploring numerous technologies to dewater and strengthen fine tailings more quickly, due to the introduction of tailings management regulations in 2009. The management of oil sand tailings is especially problematic due to the dispersion of constituent particles retained after the extraction process, resulting in a very low hydraulic conductivity. One such technology is in-line flocculation, where an anionic polymer is added to the tailings in the pipeline prior to deposition.

This study examined the dewatering behaviour of in-line flocculated oil sand mature fine tailings. Tailings used in this study had an initial solids concentration of 36% and were dosed at 650 g/tonne, using laboratory procedures that have previously been shown to represent field mixing conditions. Three layers of initial thicknesses of 0.3 to 0.35 m were successively placed in an instrumented box 0.7 by 1 m in plan, mounted on scales and equipped with a drainage system.

Increases in evaporation were found to be strongly correlated with the appearance of cracks. The actual evaporation rate exceeded the potential evaporation rate as long as crack development continued to occur. Consolidation alone was able to increase solids concentration of the tailings to about 53%. For these tailings, not much drying is required to bring the tailings to a state where they exhibit sufficent shear strength (5 kPa) to meet regulatory compliance.

Ottawa University: Mr. Zhong Han

Title: **A Unified Model for Predicting the Stiffness and Shear Strength of Unsaturated Soils**

Bio:

Mr. Zhong Han joined the Department of Civil Engineering, University of Ottawa to pursue doctoral degree under the supervision of Dr. Sai K. Vanapalli in September 2012 receiving the China Scholarship Council - University of Ottawa Joint Scholarship. Zhong's research is directed towards better understanding the mechanical behavior of unsaturated soils under static and dynamic loading conditions. One of the key objectives of his Ph.D. thesis is to propose reliable approaches that can be conveniently used in the design of geotechnical infrastructure such as the pavements for highways and railways in unsaturated soils. During the last two years, Zhong has authored or co-authored 17 technical publications in various journals and conference proceedings. He has presented his research at several national / international conferences including GeoMontreal2013 in Montreal, Canada (September, 2013), IACGE2013 in Chengdu, China (October, 2013); UNSAT2014 in Sydney, Australia (July, 2014) and EMI2014 in Hamilton, Canada (August, 2014). Zhong received Excellence Award for Structural Design from Canadian Society for Civil Engineering in March, 2014 for his poster presentation related to the design of pavements.

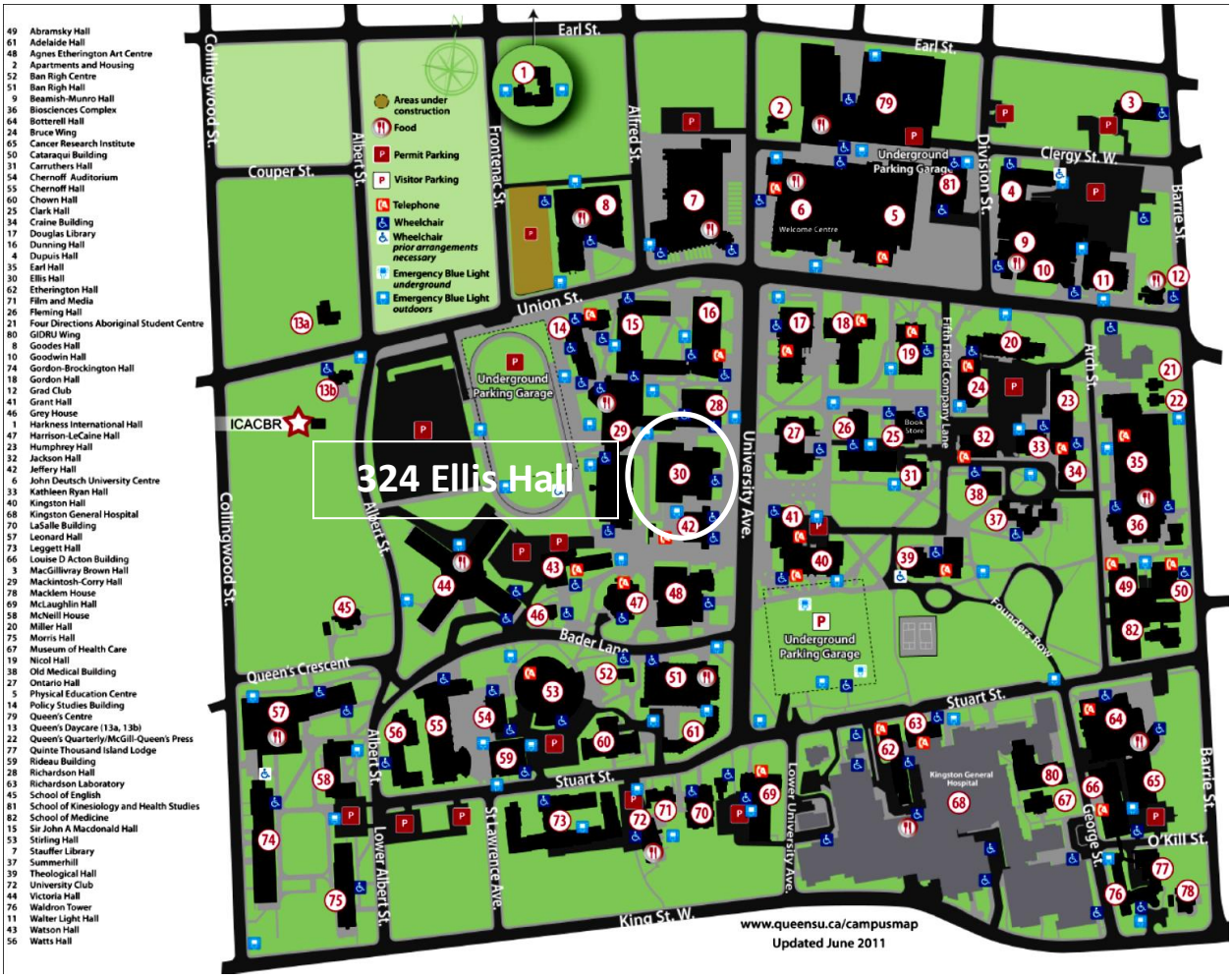
Abstract:

Mechanical properties of unsaturated soils, including shear strength τ, and stiffness parameters (modulus of elasticity E, resilient modulus MR, and small-strain shear modulus G0), are routinely required in the design and analysis of geotechnical infrastructures such as shallow / deep foundations, pavements, retaining structures and slopes. Practicing engineers are more interested in the reliable estimation of these properties as experimental measurements are time consuming, expensive and require highly trained personnel. There are several equations proposed in the literature based on different philosophies to interpret and predict variation of the stiffness and shear strength of unsaturated soils with respect to soil suction. However, a single unified model that can be used with adequate ease for estimating unsaturated stiffness and shear strength parameters will be of great value for engineering practice applications.

In this presentation, a unified model proposed for predicting the stiffness and shear strength parameters of unsaturated soils is discussed. The model uses the soil-water characteristic curve (SWCC) and one fitting parameter to predict the non-linearity of stiffness-soil suction and shear strength-soil suction correlations. A comprehensive database that comprises the experimental data on the E, G0, MR, and τ obtained from thirty different soils varying from low plastic silt to expansive soil, is used to check the validity of the proposed model by providing comparisons between the experimental measurements and the model predictions. The unified model is capable of providing reasonable predictions taking account of the influence of applied stress, soil structure / fabric, and testing techniques for different types of soils using a single-valued fitting parameter. In other words, the model eliminates the need to calibrate the fitting parameter using extensive experimental data. The proposed unified model is promising for implementing unsaturated soil mechanics into engineering practice.

Map of Queen's University

Ellis Hall
58 University Avenue
Kingston Ontario
Canada K7L 3N6



49 Abramsky Hall
61 Adelaide Hall
48 Agnes Etherington Art Centre
2 Apartments and Housing
52 Ban Righ Centre
51 Ban Righ Hall
9 Beamish-Munro Hall
36 Biosciences Complex
64 Botterell Hall
24 Bruce Wing
65 Cancer Research Institute
50 Cataraqui Building
31 Carruthers Hall
54 Chernoff Auditorium
55 Chernoff Hall
60 Chown Hall
25 Clark Hall
34 Craine Building
17 Douglas Library
16 Dunning Hall
4 Dupuis Hall
35 Earl Hall
30 Ellis Hall
62 Etherington Hall
71 Film and Media
26 Fleming Hall
21 Four Directions Aboriginal Student Centre
80 GIDIKU Wing
8 Goodes Hall
10 Goodwin Hall
74 Gordon-Brockington Hall
18 Gordon Hall
12 Grad Club
41 Grant Hall
46 Grey House
1 Harkness International Hall
47 Harrison-LeCaine Hall
23 Humphrey Hall
32 Jackson Hall
42 Jeffery Hall
6 John Deutsch University Centre
33 Kathleen Ryan Hall
40 Kingston Hall
68 Kingston General Hospital
70 LaSalle Building
57 Leonard Hall
73 Leggett Hall
66 Louise D Acton Building
3 MacGillivray Brown Hall
29 Mackintosh-Corry Hall
78 Macklem House
69 McLaughlin Hall
58 McNeill House
20 Miller Hall
75 Morris Hall
67 Museum of Health Care
19 Nicol Hall
38 Old Medical Building
27 Ontario Hall
5 Physical Education Centre
14 Policy Studies Building
79 Queen's Centre
13 Queen's Daycare (13a, 13b)
22 Queen's Quarterly/McGill-Queen's Press
77 Quinte Thousand Island Lodge
59 Rideau Building
28 Richardson Hall
63 Richardson Laboratory
45 School of English
81 School of Kinesiology and Health Studies
82 School of Medicine
15 Sir John A Macdonald Hall
53 Stirling Hall
7 Stauffer Library
37 Summerhill
39 Theological Hall
72 University Club
44 Victoria Hall
76 Waldron Tower
11 Walter Light Hall
43 Watson Hall
56 Watts Hall