

WELCOME . . .

... to the eighth issue of "The Gregg Geo News". The Geo News is being published to provide current information on the services we offer, equipment & technologies we utilize and project experience.

The Geo News is distributed in electronic form which is emailed directly to you. If you wish to become a subscriber and are not currently on our mailing list simply visit our web site and register to receive email updates. You can also access this newsletter as well as previous issues of the Geo News through our web site at: www.greggdrilling.com.

ROBERTSON'S REMARKS

- Estimating Soil Permeability from the CPT -

Lunne et al (1997) suggested an approximate method to estimate soil permeability (hydraulic conductivity) from the CPT via the Soil Behavior Type (SBT) chart using non-normalized cone resistance and friction ratio. This was based on the basic observation that sands typically have high permeability and clays low permeability and that the CPT can be used to estimate soil type and hence, soil permeability. However, Lunne et al (1997) suggested a wide range of values for soil permeability in any given soil type. In recent years, increasing use has been made of the Soil Behavior Type Index (I_c) using normalized CPT results as a means to vary empirical correlations as a function of soil type. This can also be applied to the correlation between soil type and permeability to produce the following simplified relationship: *(Continued...)*



Dr. P.K. Robertson

EQUIPMENT SPOTLIGHT

- Seabed CPT: Shallow Sea Trials -

In the last few years, Gregg Drilling has been working to increase their off-shore capabilities in deep water. With the introduction of a specially designed full size Seabed CPT unit, Gregg can now offer standard Cone Penetration Testing (CPT) with a 15cm² cone in up to 10,000ft of water. The new Seabed CPT was tested in shallow water with the launch and recovery system (LARS) in the Port of Los Angeles in April with great success. *(Continued...)*



- T-Railer®: Self Propelled Railroad Platform -

Gregg Drilling is introducing the T-Railer, a solution to site investigations in areas only accessible by rail. This unique solution to difficult access rail sites is an economical and efficient way to move equipment and materials to the site or operate directly on the tracks.

Within minutes the T-Railer can be set on the tracks or put back on the highway. Detachable loading ramps allow equipment to be driven onto the bed of the T-Railer, ready to move down the track or begin drilling or cone testing. Because the T-Railer is self-propelled, it eliminates the need to rent an engine or special machine each time you need to move equipment on the rail lines. *(Continued...)*



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New @ Gregg Drilling

Southern California Summer CPT PRICING Package!

We can help you REDUCE COSTS and WORK SMART.

Program Effective Through August 31, 2009

SMALL CPT PROJECTS:

\$1500.00
Project sites within Los Angeles or Orange Counties

and

\$2000.00
Project sites in outlying counties

Price Includes:

200 ft of CONE TESTING

OR

100 ft of CONE TESTING and
up to 6 DIRECT-PUSH SOIL SAMPLES

CUSTOMIZED CPT PROJECTS:

SPECIAL RATES AVAILABLE

\$350.00/hr - only a 2 hour minimum required

- Revised footage rates for small projects - costs capped at our daily rate. Ensures you get the BEST price.
- Revised fixed mob/demob rates by county. Avoid paying extra for traffic delays.

Click here for additional details on these
[New CPT Pricing Packages.](#)

To take advantage of the CPT Pricing Packages contact Brian Savela at:

Phone: (562) 427-6899 OR Email: bsavela@greggdrilling.com

Note: Pricing packages available for project locations in Southern California only. Packages subject to change or cancellation without notice.

Robertson's Remarks continued

Soil permeability, k (m/s) = $10^{(0.952 - 3.04 I_c)}$

or k (ft/s) = $(3.28) 10^{(0.952 - 3.04 I_c)}$

When $1.0 < I_c < 3.27$

The estimated soil permeability will be approximate, but generally within the correct order of magnitude. For improved estimates, pore pressure dissipation tests should also be performed in soil layers defined by the CPT. The dissipation of pore pressures during a CPT dissipation test is controlled by the coefficient of consolidation in the horizontal direction (c_h) which is influenced by a combination of the soil permeability (k_h) and compressibility (M), as defined by the following:

$$k_h = (c_h \gamma_w) / M$$

Where: M is the 1-D constrained modulus and γ_w is the unit weight of water, in compatible units.

Robertson et al (1992) showed that the coefficient of consolidation (c_h) can be estimated from the time for 50% dissipation (t_{50} , in minutes) for a 10 cm² cone using:

$$c_h = (0.0167)(10^{-4}) 10^{(1 - \log t_{50})} \quad \text{m}^2/\text{s}$$

or $c_h = (0.1797)(10^{-4}) 10^{(1 - \log t_{50})} \quad \text{ft}^2/\text{s}$

For a 15cm² cone the values of c_h are increased by a factor of 1.5.

Robertson (2009) recently updated the correlation to estimate 1-D constrained modulus (M) using: **(Continued...)**

Seabed CPT continued

Advantages of the Seabed CPT:

- Conducts Cone Penetration Testing (CPT) with a 15cm² cone in up to 10,000ft of water.
- Operates off a vessel of opportunity eliminating the need to mobilize a specialized drill ship or large vessel.
- A compact and lightweight frame enables Gregg to operate off smaller vessels without the need for large cranes or massive winch systems.
- High-quality Shilling telemetry and robotics allow precise movements and data collection in deep water.
- Gregg's patented hydrostatically compensated cone measures zero load under 10,000ft of water pressure; therefore enabling precise and high-quality cone measurements.



20 ton push capacity
Seabed CPT unit

For more information about Gregg's near-shore and off-shore site investigation capabilities, please contact Tim Boyd at: email: tboyd@greggdrilling.com or phone: (925) 313-5800

[Click here to view additional specifications on the Seabed CPT](#)

T-Railer® continued

T-Railer® Capabilities:

- Self-propelled with enough horsepower to move an 80,000lb load at 15mph in forward or reverse.
- Detachable ramps for quick equipment loading.
- Accesses and connects to rail lines from any access road at any angle to the tracks.
- Equipment can operate directly off the T-Railer® to complete drilling or Cone Penetration Testing (CPT) directly over the rail lines.



T-Railer® with CPT Truck



Limited access drilling on the T-Railer®

For more information about Gregg's T-Railer®, please contact Brian Savela at: email: bsavela@greggdrilling.com OR phone: (562) 427-6899

[Click here to view additional specifications on the T-Railer®](#)

Robertson's Remarks continued

$$M = \alpha_M (q_t - \sigma_{vo})$$

when $I_c > 2.2$ use:

$$\begin{array}{ll} \alpha_M = Q_t & \text{when } Q_t < 14 \\ \alpha_M = 14 & \text{when } Q_t > 14 \end{array}$$

Where Q_t is the dimensionless normalized cone resistance.

In fine grained soils, $Q_t = (q_t - \sigma_{vo}) / \sigma'_{vo}$

when $I_c < 2.2$ use:

$$\alpha_M = 0.0188 [10^{(0.55I_c + 1.68)}]$$

Hence, combining the above will provide a site specific correlation for soil permeability based on CPT results (i.e. penetration resistance and dissipation test results).

Contact Peter with any questions or comments regarding "Robertson's Remarks" at: probertson@greggdrilling.com.

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