Shallow foundation load-settlement prediction exercise


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SUMMARY

We invite geotechnical practitioners and academics from around the world to submit a prediction of the load-displacement response of a shallow foundation loaded to failure on soft clay.

The aim of the exercise is to identify what methods are currently used to predict foundation performance and to determine how well these methods perform. The exercise is intended for education rather than competition and predictors will remain anonymous.

A journal paper will be prepared presenting comparisons of all predictions with measured results as the method of dissemination and forming a written record for the public domain.

The field test forms part of the activities of the Australian Research Council Centre of Excellence for Geotechnical Science and Engineering (CGSE) and was carried out at the National Field Testing Facility in Ballina, NSW, Australia.

INSTRUCTIONS FOR PARTICIPANTS

1. Read the rest of this document to find out the “Site and Foundation Information” and “Instructions to Access Project Data” via an online data mapping application.
2. Log on to the data map web app (instructions below) to access in situ data, laboratory data and written reports related to the site.
3. Complete the “Foundation load-settlement prediction submission page” at the end of this document and email it to james.doherty@uwa.edu.au by 1 December 2016. You may send additional information related to your prediction if you wish, but the required summary results must be submitted on the provided pro-forma.

SITE AND FOUNDATION INFORMATION

Site: The site, located north of Ballina, New South Wales, Australia and was previously used to farm sugar cane, comprises a crust of alluvial clayey silty sand underlain by soft estuarine clay.

The ARC Centre for Excellence in Geotechnical Science and Engineering (CGSE) has leased the site to develop and demonstrate new and existing site investigation tools and provide the opportunity of validating and calibrating analytical and numerical design methods for geotechnical boundary value problems.

Geotechnical investigation: Extensive field and laboratory testing has been carried out in or on the Ballina clay and results are presented using the data map web based application.

Foundation: The foundation was constructed in the transition zone between the crust and the underlying estuarine clay. At the foundation location, the crust was approximately 1.5 m thick and the water table was approximately 1.0 m below ground level. A 1.4 m deep pit was excavated in which a 1.8 m square, 0.6 m thick concrete foundation was cast (see Figs. 1 - 3).

Loading: 1 month following construction of the foundation, the foundation was centrically loaded with precast concrete blocks until failure. Load applied to the foundation normalized by the failure load is plotted against time in Figure 4 to give an indication of the rate of loading.

Figure 1: Excavation of foundation pit  Figure 2: Foundation before loading
Figure 3: Setup of the foundation test

Figure 4: Normalized foundation load time history
INSTRUCTIONS TO ACCESS PROJECT DATA

All site data from the NFTF is available through a data map web app. To access the data:

1. Go to [www.geocalcs.com/datamap](http://www.geocalcs.com/datamap) and register by completing the form shown in Figure 5.

![Registration page screen shot](image)

**Figure 5: Registration page screen shot**

2. Click on “My Project” in the upper left corner. Enter the details as shown in Table 1 and click on the “Join Project” button (Figure 6). Navigate back to the Map view by clicking the “View Map” link in the upper right corner of the screen.

<table>
<thead>
<tr>
<th>Project name:</th>
<th>NFTF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Project code:</td>
<td>Ballina</td>
</tr>
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**Table 1: Project details to access NFTF project data**

![“Join project” screen shot](image)

**Figure 6: “Join project” screen shot**

Viewing and downloading the data

In view mode, Google Maps is used to display pins that represent the test locations over the site (see Figure 7). Each pin provides a link to data collected from that location. When a pin is selected, the metadata, or information about the data, that is associated with that pin is displayed (see Figure 8).

**Figure 7:** Data map overview with current pins at the NTF

**Figure 8:** Pin selection with image previewing the data

Pin data includes the “Data ID” and the “Data type” and an image that provides a preview of the data that is stored. Users can then download the file containing the data by clicking on the “Download file” button. Data files are usually in the form of Microsoft Excel, but other site information may be pdf. The preview images are png or jpeg files and these can also be selected and saved locally for later use.

Figure 8 shows a screen shot of the menu that appears when Pin MEX9 is select. This Pin currently has 11 triaxial tests associated with it. Each test can be individually accessed using the scroll bar on the right hand side.

The left hand side of the screen provides users with the ability to filter the data by Pin ID or “Data type”, so that information of interest can be quickly and easily found. For example if a user is in only “Triaxial” data, then check box next to the “Triaxial” can be selected and after hitting the filter button, only the two pins that contain triaxial data remain visible.

The location of the foundation and its construction details can be found by selecting the check box for “Shallow foundation construction details” under the “Data” tab and hitting the Filter button (Figure 9).

Figure 9: Location of shallow foundation and construction details
## FOUNDATION LOAD-SETTLEMENT PREDICTION SUBMISSION PAGE

**Name:**

**Company:**

**Email:**  
**Phone no.:**

1. Please provide information of how you derived the soil properties used in your calculations.

______________________________________________________________

______________________________________________________________

2. Please describe the method used to predict the failure load of the foundation.

______________________________________________________________

______________________________________________________________

3. Please describe the method was used to predict the settlement of the foundation.

______________________________________________________________

______________________________________________________________

4. What failure load is predicted?

________ kN

5. What is the predicted settlement at

a) 25% of the failure load? ________ mm

b) 50% of the failure load? ________ mm

c) the point of failure? ________ mm

Please feel free to append any additional information or commentary that you would like to include in your submission. All data (Excel sheets etc.) that describe the used method are welcome, but the final submission must also be summarized on this sheet.

Email to james.doherty@uwa.edu.au by 1 December 2016