Development of a Geotechnical Information Database

Introduction

The knowledge of existing soil conditions prior to road and bridge construction can reduce construction cost, time, and headaches. The field data and laboratory results collected far in advance of project construction are often slow to reach the project designers because of the data's volume, presentation, and storage methods. The current data storage method needed updating to allow for easy retrieval, also allowing for a more practical and accurate estimate of the site conditions.

The project originated from the Geotechnical Design Section at the Louisiana Department of Transportation and Development (LADOTD) and their need to review historical geotechnical data prior to new design decisions. The database would also serve as a valuable reference resource, ultimately promoting a better road design.

Objective

The purpose of this project was to create a user-friendly geotechnical Web site, so the LADOTD Headquarters' Geotechnical Design Section and other LADOTD sections will have access to the appropriate and necessary resources to make the best design decisions.

Scope

The scope was limited to creating quick and logical access to existing boring logs that were already scanned and stored in digital format. Additional borings in hard copy, microfiche, and other formats were not included as part of this study but could be added in additional project phases. The data will be accessed mainly by the Headquarters' Geotechnical Design Section as well as the Louisiana Transportation Research Center (LTRC) and district laboratory offices.

Methodology

Initially, researchers planned that the project would require its own computer server to store the vast amounts of data. Upon further review of existing LADOTD databases and storage capabilities, it was concluded that only an interface was necessary to access different existing databases which already exist within (and outside) LADOTD. Content Manager (CM), an enterprise document (object) management system, already used within the Department is key to capturing, storing, retrieving, and printing online documents within the Department. The scanned boring logs were stored in CM along with project details found within the Tracking of Project System (TOPS) database.

Global Information System (GIS) was used to interlink the existing databases to retrieve the required information and develop a user-friendly interface to not only display the required information but also to link it to the scanned boring logs in CM to speed up access times, compared to hardcopy searches, consolidating vast amounts of information into one online resource.

Another non-GIS Web site was developed for users to search the boring logs based on project number, route, district, engineers, etc. This Web site also links the boring logs to CM and the GIS Web site so searched boring logs can be mapped on the GIS Web site in the form of control sections or Global Position Points (GPS) where available.

Conclusions

This project developed a GIS-based mapping application, which allows the Geotechnical Design Section and others access to boring logs and other geotechnical documents via the Intranet. It has provided access to boring logs, bridges, bridge scour, Cone Penetration Test (CPT) data, and other sources. The virtual geotechnical database of this project can be found at the LADOTD GIS Web page located at http://gis.dotd.la.gov/info/home.aspx on the LADOTD Intranet Web site.

The implementation of the GIS Web site application has benefited the Department by enhancing the Geotechnical Design Section's ability to select proper boring depths. "Additionally, the information attached to the database such as load test data, pile driving logs, and other activity logs will greatly improve the pile resistance prediction. The better pile length prediction may ultimately reduce the cost of foundation construction." (Ching Tsai, LADOTD Geotechnical Design Section).
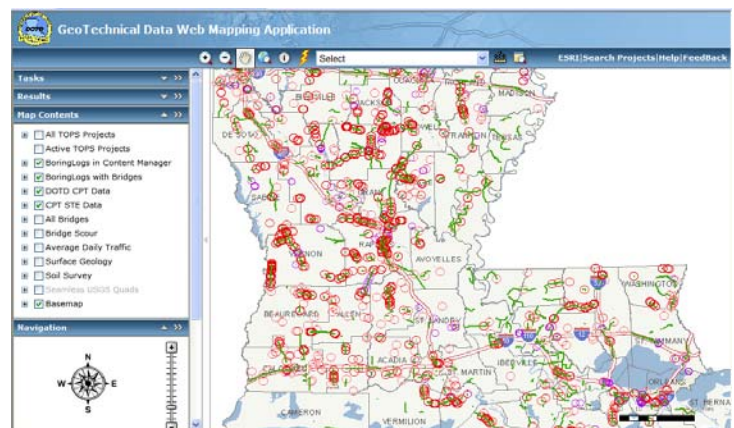
Recommendations

It is recommended that a Geotechnical Design Section employee be designated to maintain (scan and upload) the in-house geotechnical documents to Content Manager so that records are kept up-to-date, accurate, and in digital format. One goal of the project is to eventually open the Web site to the public. However, additional efforts regarding firewalls, user security, and level access will need to be implemented for this to occur. This should be proposed as part of an extension project to incorporate additional geotechnical modules (pile records, microfiche historical data, etc.) and others based on the Geotechnical Design Section's needs and recommendations.

The LADOTD implementation of the Geotechnical Information System should include the storage, management, and access of the electronic geotechnical data that will be accumulated in the future so that design engineers can have quick, responsive, and interactive data. Enhancements to the Web site and application should be incorporated in phases so that the Geotechnical Information Database becomes an even more valuable resource. This project has expansion possibilities for future studies by including data from other various sources to provide more information and details to designers.