EXECUTIVE SUMMARY:REINFORCED-SOIL EMBANKMENT ON SOFT FOUNDATION

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A section of I-670 in Columbus, OH, constructed during 1997-1998, includes a 33 ft.(10m) high embankment over a deposit of very soft sludge. The design used geosynthetics for reinforcement of the embankment and wick drains to accelerate the consolidation in the sludge. Stage construction was used to allow consolidation of the sludge. To verify the design assumptions, a test embankment was completed in 1993. The performance of the test embankment provided the information for the design of the full-scale embankment. This project provided the opportunity to demonstrate the application of research findings from the test embankment to actual design and construction.

The objective was to demonstrate how research findings can be used in design and construction. This report shows (1) how the results of the test embankment were used in the design of the full-scale embankment and prediction of the embankment performance, (2) how observation of the embankment performance can be used as construction control and (3) how the results can be used in future application of similar technology.

In this study, predictions of consolidation rate, settlement, horizontal movement, geotextile strain and sludge strength were made using conventional and finite-element methods and material properties determined from laboratory tests and performance of the test embankment. Overall, the prediction methods used here can estimate the right order of magnitude of consolidation rate, displacement, strain, and strength to an accuracy of 50 % or better.

Our recommendation is that the procedures used in the measurement of material properties, the design of the embankment, the prediction of embankment performance and the use measurements during construction for construction control provide an effective methodology that can be applied to the design and construction of other reinforced-soil embankments over soft ground.

The results of this project can be implemented through the use of the procedures developed here for the design and construction of future projects. The general approach of using a test embankment to verify critical design assumptions and careful monitoring of performance during construction as a part of construction control has proven to be successful. More specifically, the laboratory tests, the methods for estimating rate of consolidation, strength after consolidation, and stability, and the program for monitoring embankment performance for construction control can be implemented in future projects involving embankments on soft ground. This report and the related reports can serve as reference material for future projects.