GRL Engineers, Inc.

I-4 Ultimate Mega Project

Challenge:

The enormous, 21-mile long, infrastructure project, I-4 Ultimate, consists of 15 major interchange reconstructions, 74 bridge replacements, 13 bridge widenings, and 53 new bridges. Given the variable nature of the typically prevalent geotechnical conditions throughout the I-4 Ultimate project corridor, the selected foundation type to support the various bridges were impact driven steel and precast concrete piles. GRL Engineers, Inc. was a member of the SGL Constructors design/build team brought onto the project in 2015 to assess pile driveability with GRLWEAP wave equation analyses. During construction, GRL performed PDA pile driving monitoring and CAPWAP® data analyses, and then provided production pile installation and driving criteria recommendations. The accelerated construction schedule needed to build over 150 bridges, each with unique foundations requiring an efficient pile driving operation, was key to the overall work.

Method:

The I-4 Ultimate bridges were supported on 24-inch concrete piles, 24-inch steel pipe piles, and 14-inch H-piles. Working with the project design/build team to satisfy their requirements, as well as FDOT's specifications, GRL Engineers were instrumental in providing PDA dynamic testing services with associated CAPWAP analyses. These services determined that the required pile capacities were obtained in the variable subsurface conditions, driving stresses were held within specification limits, and that structural integrity of various bridge deep foundation types was maintained. The pile testing and foundation work required submitting critical and timely engineering reports to all involved parties in the QA/QC and design/build chain so the overall project could proceed without delay.

Results:

Pile dynamic PDA measurements collected during driving assessed the hammer and drive system performance, pile driving stresses, pile structural integrity, and pile capacity. **Figure 1** represents test results from a 24-inch diameter by 0.5-inch wall thickness steel pipe pile driven with a hydraulic hammer to a depth of more than 400-feet. CAPWAP results, presented in **Figures 2 and 3,** provide the soil resistance distribution and mobilized capacity, the dynamic soil properties, maximum driving stresses, and a simulated static load test load-displacement plot.

To learn more about GRL Engineers, visit www.grlengineers.com or email us at info@grlengineers.com.

Project Details

Client: SGL Constructors

Location: Orlando, Florida

GRL Office: Florida

GRL Services

- GRLWEAP Wave Equation Analyses
- PDA Pile Driving Monitoring
- CAPWAP Analyses
- Production Piles Recommendations

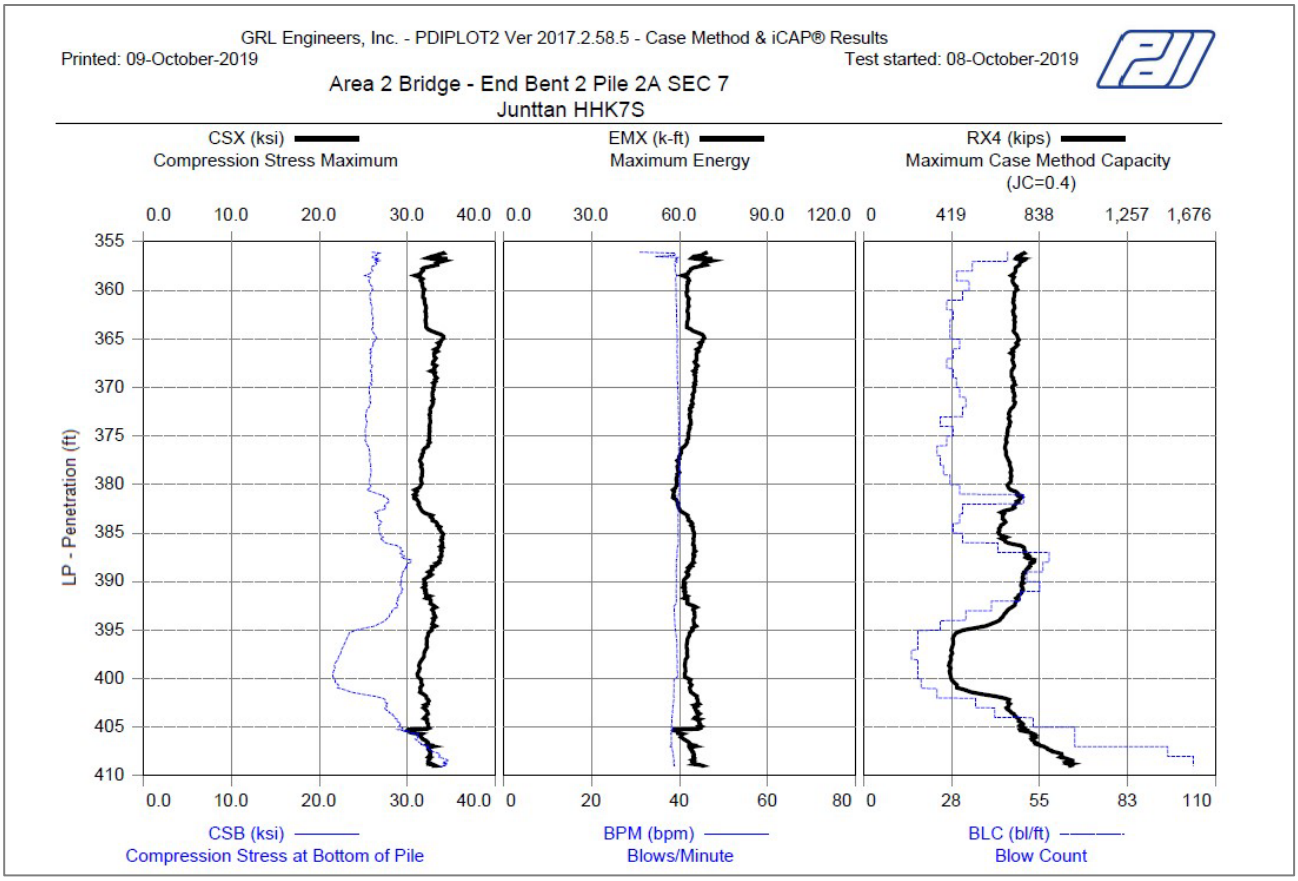

Figure 1. Sample Dynamic Test Results vs Depth for a Steel Pipe Pile

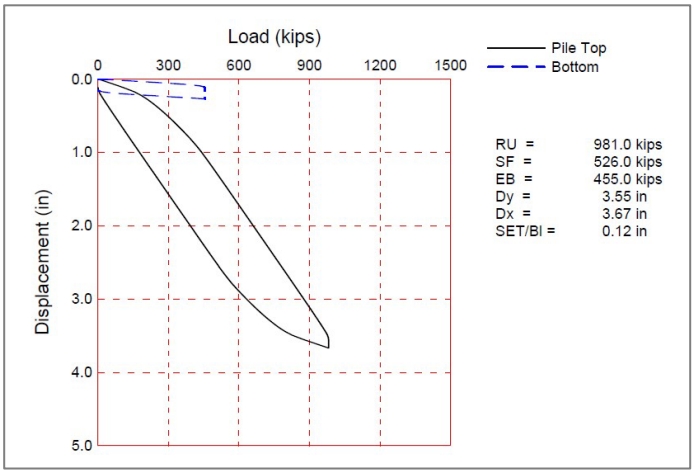

Figure 2. CAPWAP Simulated Static Load Test Load-Displacement Plot

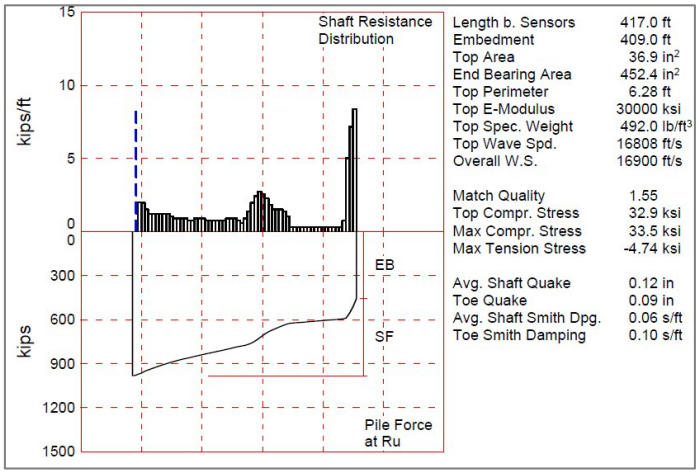

Figure 3. CAPWAP Resistance Distribution, Dynamic Soil Properties, and Maximum Driving Stresses