G2 CONSULTING GROUP

Replacement and Widening of Ten Bridges, I-94 from 9 Mile Road to Quinn Road

G2 Consulting Group, LLC performed geotechnical investigations for replacement or widening of ten bridges along the I-94 expressway stretching from 9 Mile Road in Roseville, MI to Metropolitan Parkway in Harrison Township, MI. At some of the bridge locations, the existing bridge piers are supported on deep, cast-in-place, concrete piers, while the bridge abutments are supported on shallow continuous footings. At other bridge locations, both the piers and abutments are supported on shallow foundations. Significant differential movement and associated distress and deterioration of the original structures was visually evident in many areas.

Our investigations consisted of performing soil borings near the existing piers and abutments and evaluating the soil conditions encountered. In addition, we reviewed soil borings performed prior to the original construction of the bridges, along with the construction drawings for the existing structures. Our soil borings were extended to depths ranging from 75 to 128 feet below the existing ground surface, typically extending into the deep hardpan layer.

Laboratory testing for these projects included Atterberg limits, particle size analyses, unconfined compressive strength testing, and one-dimensional consolidation testing. Field vane shear tests were also performed during drilling to

determine the in-place shear strength of the extensive deposits of soft cohesive soils encountered within the borings.

G2 determined that the distress to the existing structures was likely the result of total and differential settlement between the piers and abutments, due to either the use of shallow foundations bearing on soil overlying soft clay deposits, or because of the use of composite pile and spread footing foundation systems. In order to reduce the total and differential settlement potential of the foundation systems, G2 recommended, for the cases where total bridge replacement was proposed, that both the piers and abutments be supported on driven HP steel piling extending into the deep, firm soils or underlying hardpan material. For bridges that were to be widened, our recommendations were to support the new abutments on shallow foundations bearing at similar depths to the existing abutment foundations, to minimize settlement between the new and existing structures and to support the new piers on driven steel piles extending into the hardpan layer.