PROJECT PROFILE

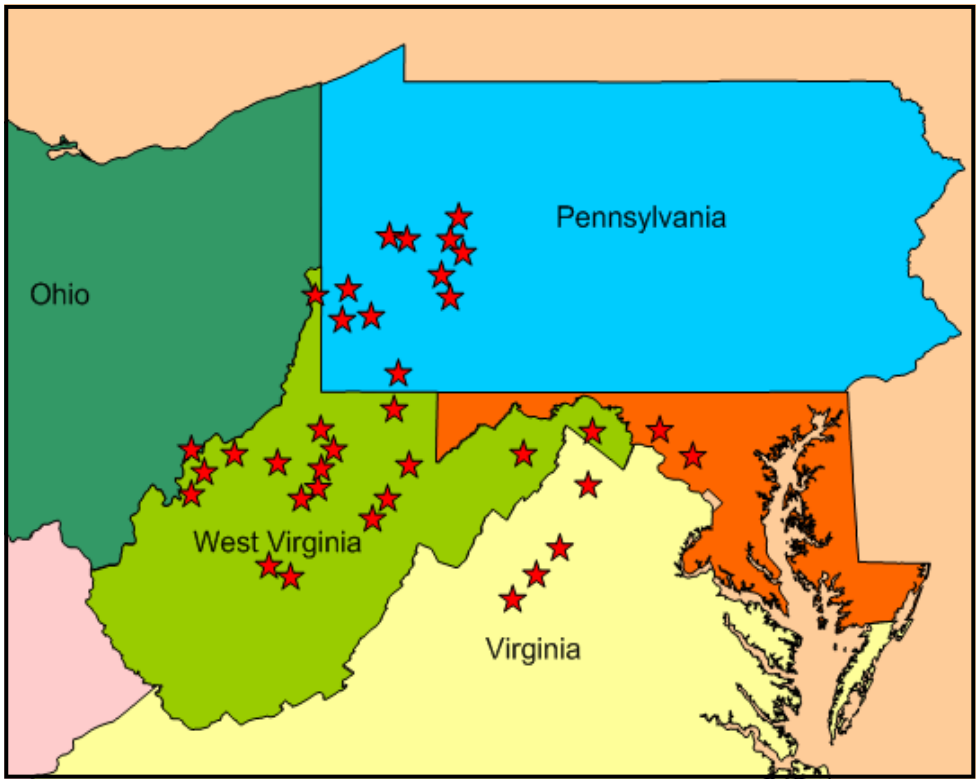
FOUNDATION RECOMMENDATIONS FOR MICROWAVE TOWERS

As geotechnical engineering consultant, D'Appolonia directed subsurface explorations and prepared recommendations for the design of foundations for 37 microwave communication towers for Allegheny Power Systems. The 3-legged and 4-legged, unguyed towers ranged in height from 30 to 280 feet. The project sites were located in five states and exhibited widely varying subsurface conditions.

D'Appolonia's responsibilities for this project included obtaining and reviewing available geologic, topographic and mining information for each site; directing subsurface exploration of soil, rock and ground water conditions; developing laboratory testing programs for soil and rock samples; and determining engineering parameters needed for foundation design. Foundation alternatives including spread footings, mat footings and drilled foundation were evaluated, and a report was prepared for each site presenting the results of the field exploration program, analysis results, and design recommendations.

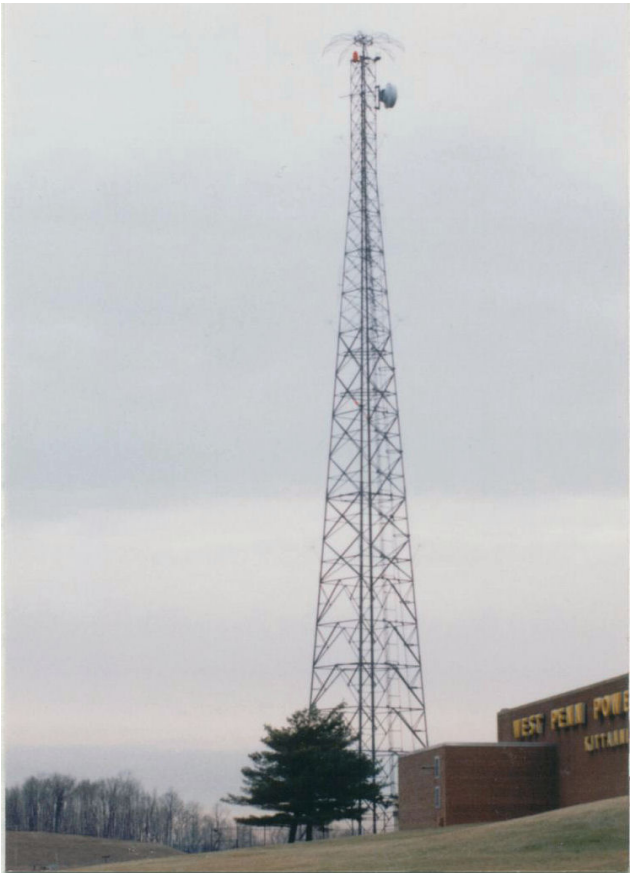
Review of maps of mine workings and available subsidence maps revealed the presence of abandoned mine workings beneath several of the sites. D'Appolonia addressed the undermining concerns without incurring the major expense associated with backfilling the mines.

For most of the towers, drilled shaft foundations were found to be the most attractive alternative because of the need for resisting large lateral forces and also for minimizing construction equipment requirements for the many remote locations. Where drilled shaft foundations were considered, the lateral load-deformation behavior of the foundations was modeled using the COM624 computer program, which could incorporate non-linear load-deformation relationships in the characterization of soil-structure interaction and for estimation of lateral deflection, rotation, moment, axial load and shear for given load combinations.



Locations of 37 microwave tower foundation projects.

At one site in Virginia, karst conditions, which posed obstacles to foundation design, were encountered. Competent bedrock at one tower support location was encountered 20 feet below the ground surface, whereas soft silts, clays and other residual soils were encountered at the same elevation at the adjacent foundation locations, with competent rock at substantially greater depths. Limestone bedrock encountered at a depth in excess of 55 feet at these locations had been affected by chemical weathering and contained soil and silt-filled voids and layers of clay. In this instance, D'Appolonia recommended a concrete mat foundation, which was successfully constructed and has functioned as designed.



Completed microwave communications tower on drilled-shaft foundations designed by D'Appolonia.