CESARE, INC.
Geotechnical Engineers & Construction Materials Consultants

NORTHWEST PARKWAY
BROOMFIELD COUNTY, COLORADO

Client Contact:
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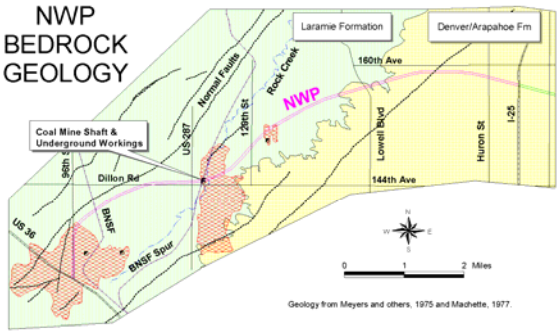
Services Provided:
- **Geotechnical Studies**
- **Design Recommendations**
- **Laboratory Testing**

Project Summary:

Cesare, Inc. (Cesare) conducted geotechnical studies and presented design recommendations for 7.8 miles of limited access freeway and 21 bridge structures around the northwest quadrant of the Denver Metropolitan Area. The Northwest Parkway extends from U.S. Highway 36 in Broomfield to Interstate 25 in Adams County. Design recommendations included bridge foundation systems, embankment construction, pavement design, and other construction issues. Unique geotechnical challenges included soft compressible clay soils, high groundwater, expansive soils and claystone bedrock of the Laramie, Denver, and Arapahoe Formations, dipping bedrock, and the presence of coal mine shafts and loose coal mine waste.

Over 250 soil borings for roadways, bridge structures, and retaining walls were drilled and sampled. Laboratory testing was conducted on Shelby tube samples, California liner samples, and bulk samples. Laboratory testing included index property values, R-values, unconfined compressive strength, time consolidation, and direct shear. Recommendations were provided for pavement sections, pipe and utility trench backfill, drilled pier bridge supports, driven pile bridge supports, spread-footing foundations, toll booth building and tunnel foundations, lateral loads on retaining walls, wick drain installation, mechanically stabilized earth (MSE) wall soil parameters and global stability, and measures for ground water control. Cesare also provided consultation on geotechnical issues during construction.

Cesare was concerned for the long term stability of MSE walls founded on claystone bedrock. Claystone tends to swell upon exposure to water which results in a weakening of the overall clay structure and a loss of support strength. The reduction of foundation strength had to be considered in the wall design.



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