

Marine Levee Design & Construction For Gulf Coast Industrial Infrastructure

University of Washington Civil & Environmental Engineering Capstone project - Industry Sponsor: Bechtel Corporation

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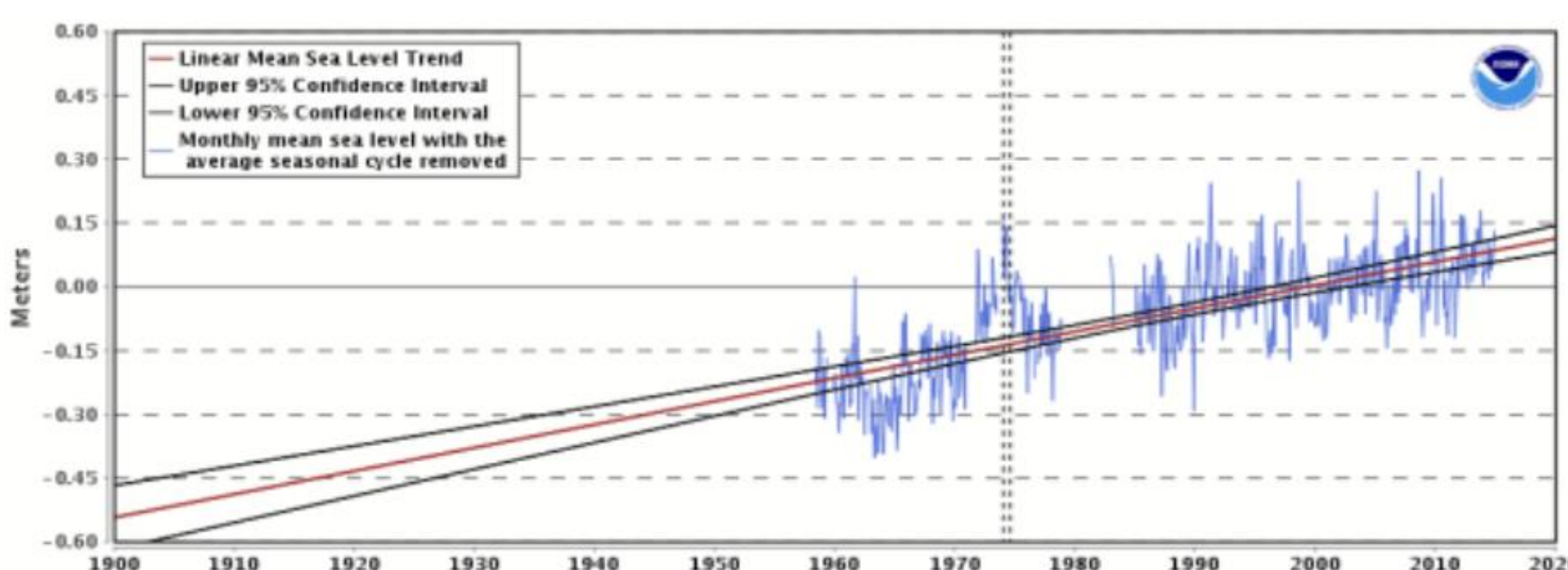
Project Overview

The project goal was to design a perimeter levee to protect a proposed Gulf Coast industrial facility from flooding, storm surge, sea level rise, and long-term settlement.

Achieving this required hydrologic analysis, geotechnical characterization, slope stability modeling, settlement analysis, and construction planning to develop a levee capable of meeting a 30-year design life.

Multiple stabilization methods were evaluated to balance long-term performance, constructability, and project cost.

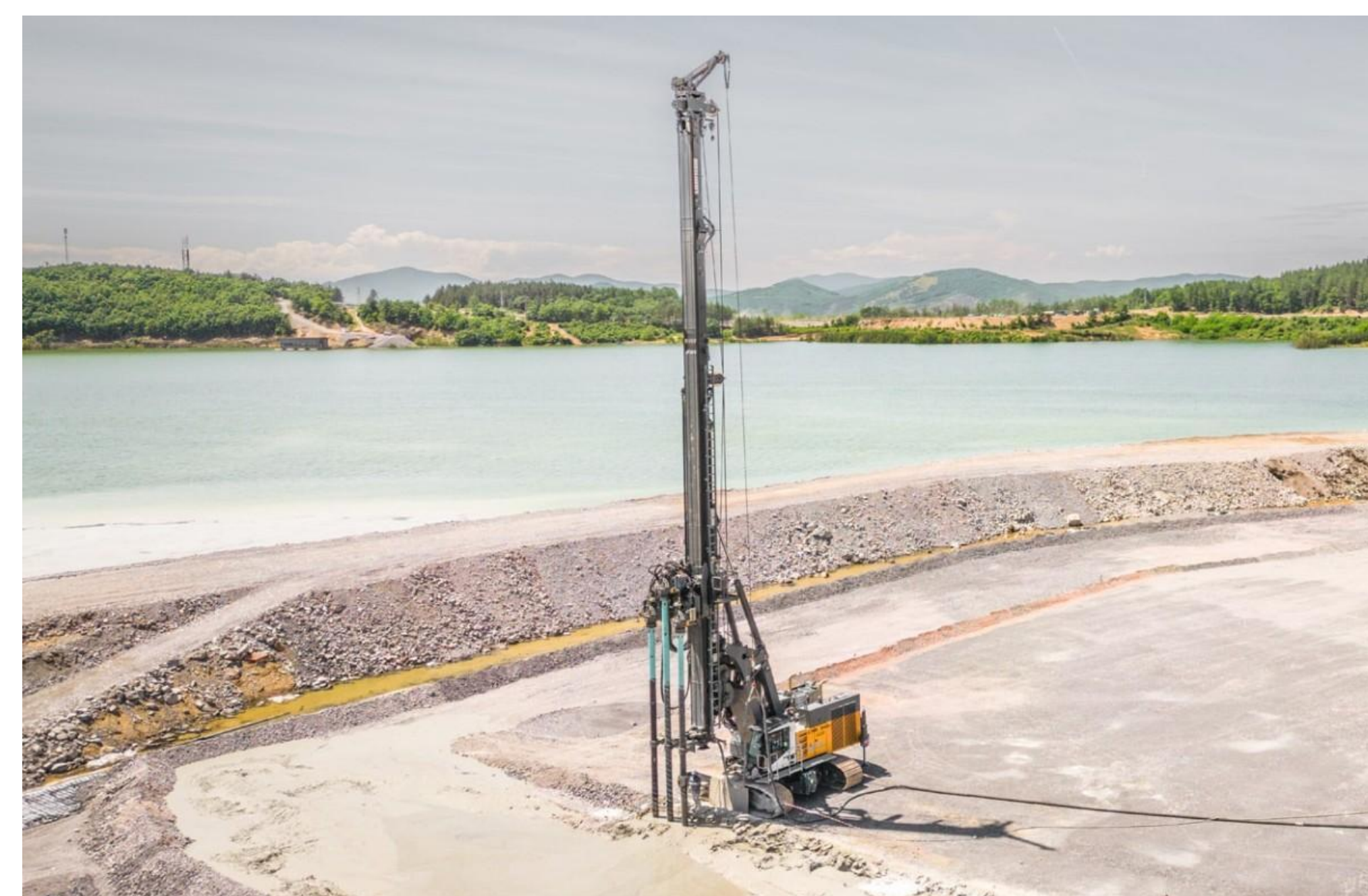
Crest Elevation Considerations



Hydrologic hazard assessment used to establish levee crest elevation included FEMA flood elevations and NOAA sea level rise projections for the Texas Gulf Coast

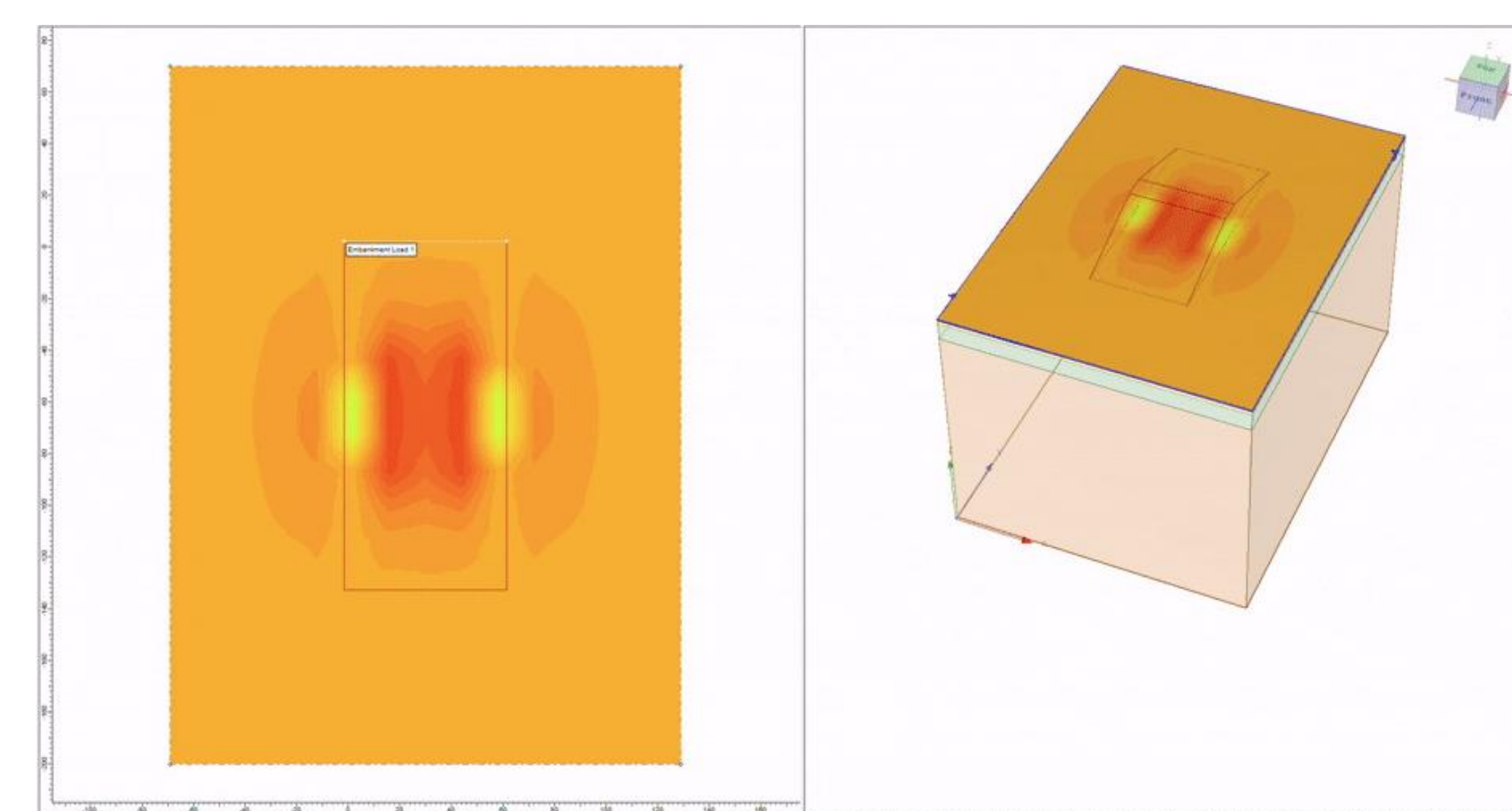


Subgrade Preparation



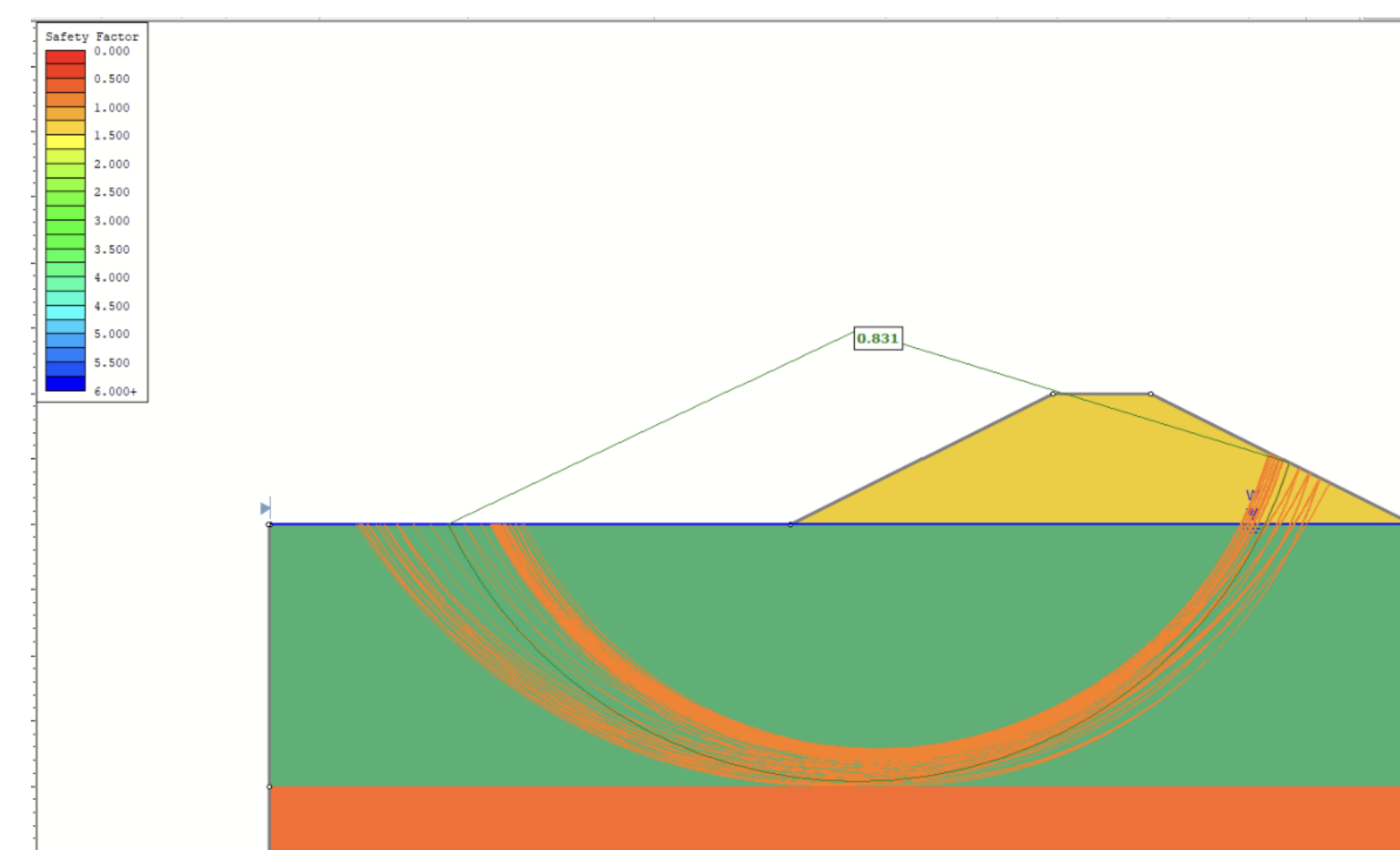
Deep Soil Mixing (DSM) equipment is used to improve weak foundation soils beneath levee embankments.

Settlement Analysis



Modeled settlement versus time response for representative levee profiles over the 30-year design life.

Slope Stability Analysis

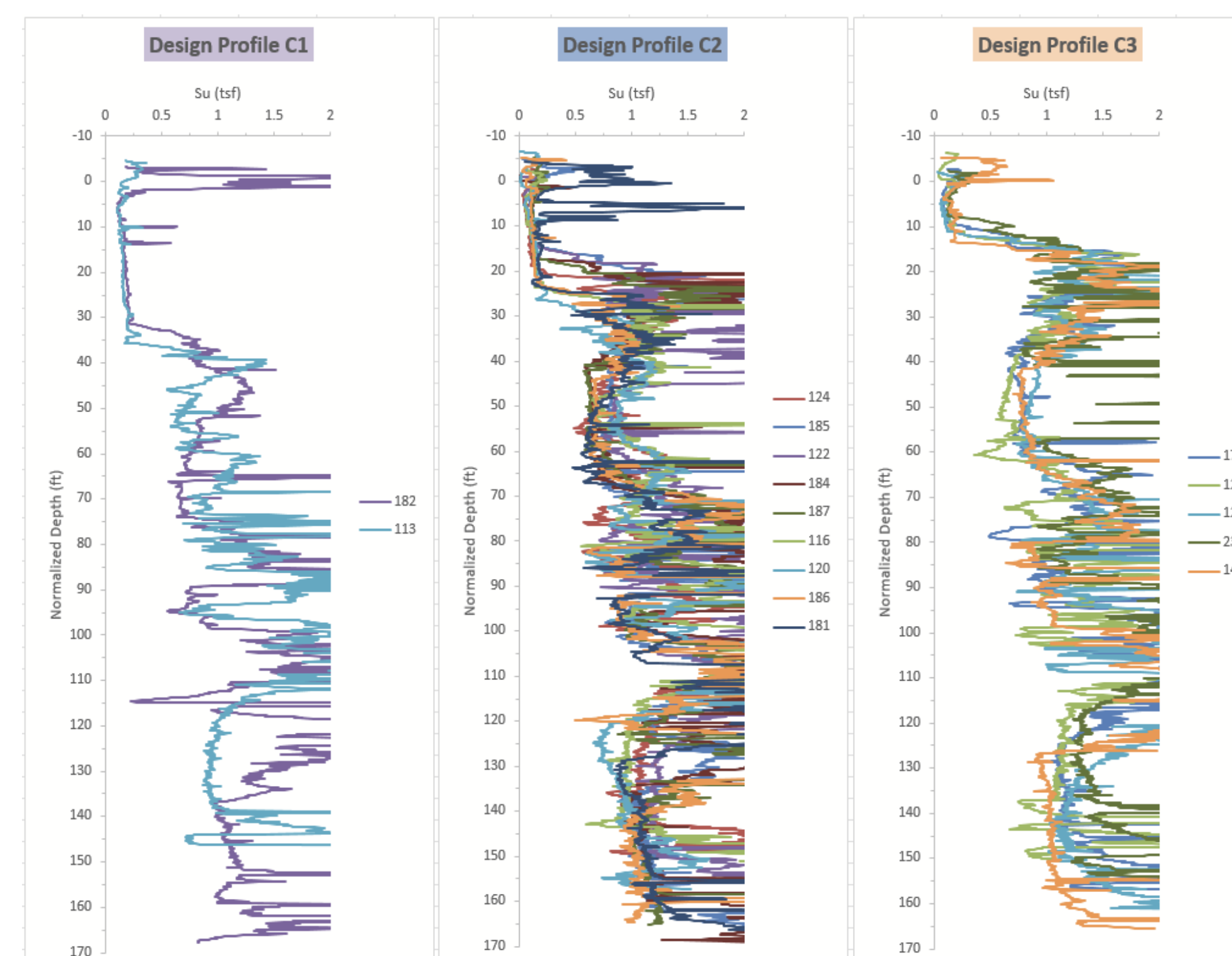


Representative Slide2 slope stability model showing predicted failure surface and factor of safety for levee loading conditions.

Analysis

FEMA flood elevations, NOAA sea level rise projections, and CPT geotechnical data were used to establish levee crest elevation, representative soil profiles, and required stabilization measures for long-term levee performance.

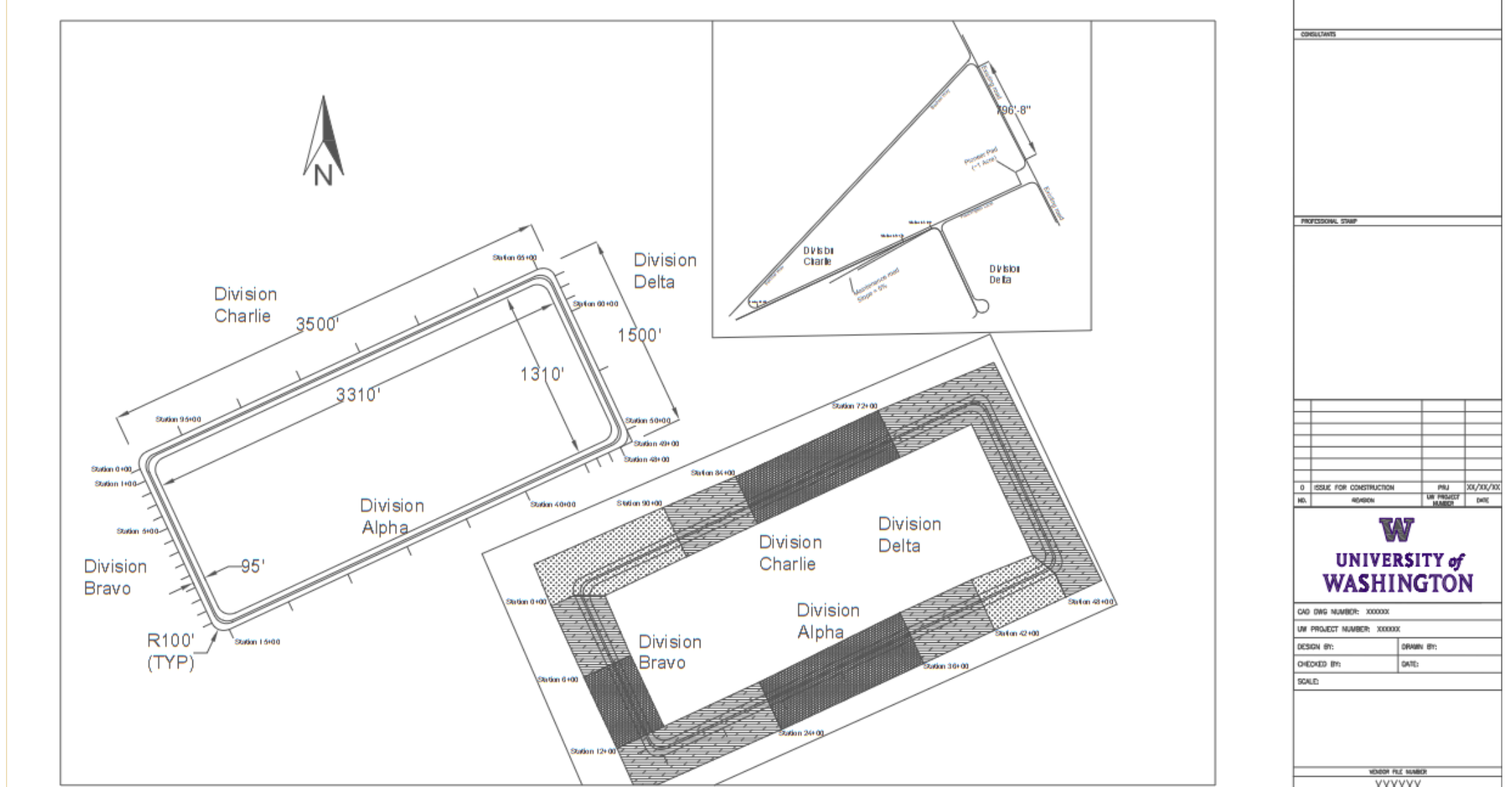
Cone Penetration Testing/Soil Profile



Processed CPT data grouped into representative soil profiles based on soft clay thickness and undrained shear strength characteristics.

Design Plans

Levee Site Overview

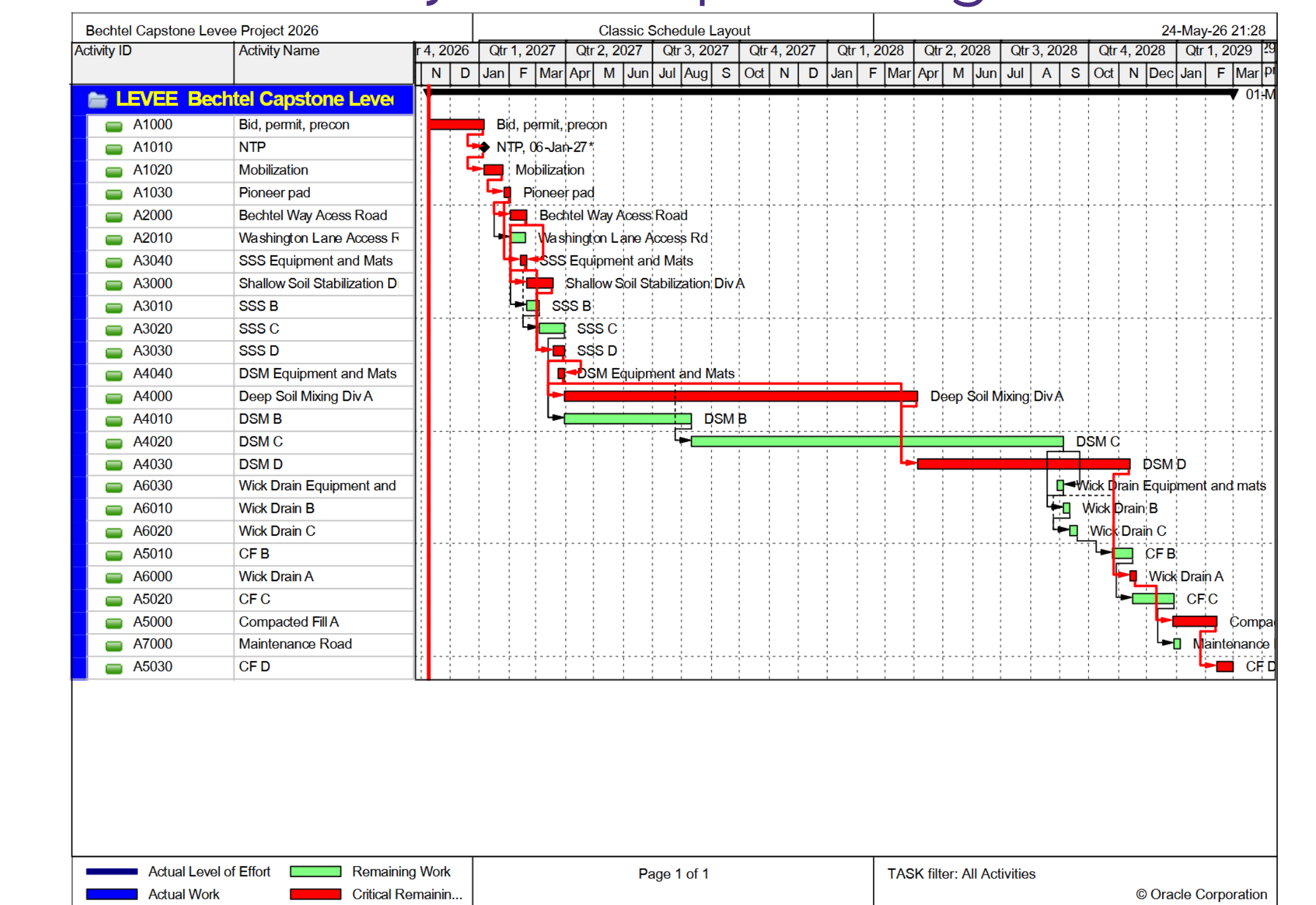


Design plan showing representative levee alignment, stabilization zones, and construction staging considerations

Construction Plan

Construction sequencing considered order-of-operations constraints, equipment access, material staging, workforce scheduling, weather delays, and project timeline requirements. Primavera P6 software was used to develop a phased construction schedule project sequencing timelines for levee stabilization and embankment construction activities.

Project Sequencing



Phased construction Gantt chart, showing sequencing and coordination of major levee construction activities.

Design

Slope stability, settlement behavior, and construction cost analyses were used to develop three representative levee designs for varying subsurface soil conditions across the site.

All sections utilized 2:1 embankment slopes with combinations of Deep Soil Mixing (DSM), Shallow Soil Stabilization (SSS), and wick drains to achieve required stability and consolidation targets