U.S. Department of Transportation
**Federal Highway Administration**

# FHWA GEOTECHNICAL ENGINEERING PROGRAM

Southeast States Geotechnical Engineers Conference
September 15 – 18, 2025

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# FHWA GEOTECHNICAL PROGRAM

The Geotechnical Team is currently comprised of 21 Full-Time Engineers:

Headquarters Program Office (3)

- Justice Maswoswe
- Khalid Mohamed
- Silas Nichols

Research (1)

- Jennifer Nicks

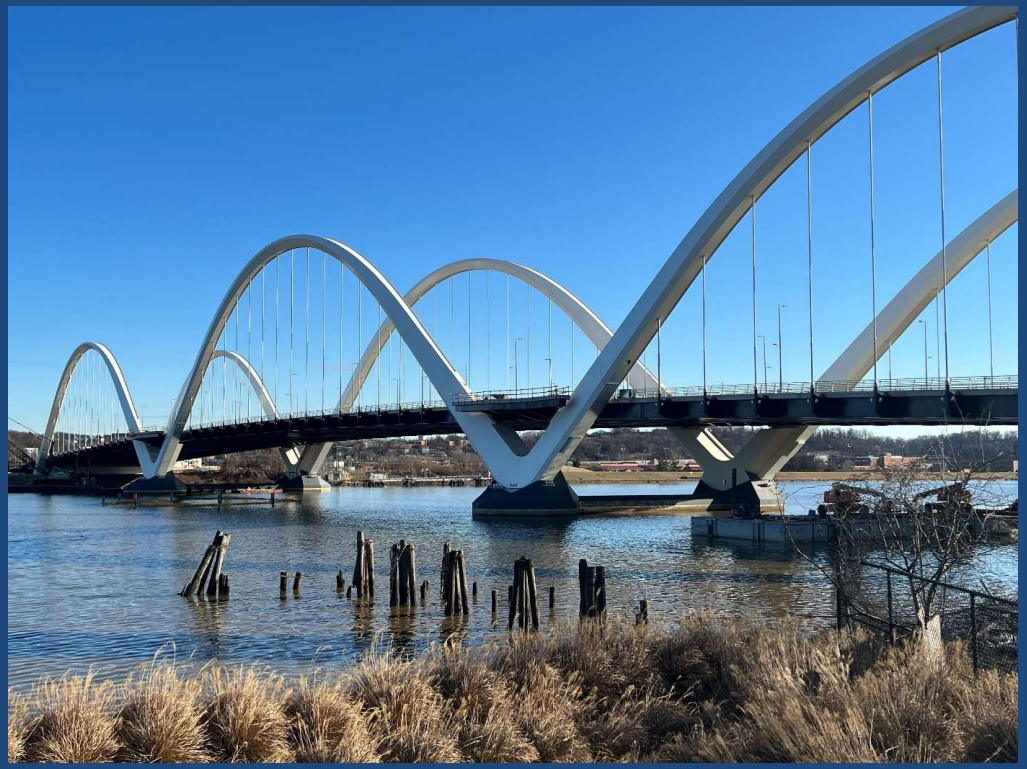
Federal Lands (17)

- Eastern, Central, Western

# FHWA GEOTECHNICAL PROGRAM

- Broad program with both research and program roadmaps
- Reflects trends and opportunities influencing and impacting the discipline
- Priorities identified through annual Geotechnical Spending Plan
- Roadmap is informed through feedback from State DOTs, FHWA Division offices, industry, and academia

# FHWA GEOTECHNICAL PROGRAM



Headquarters Roles and Responsibilities:

- Direct support of state project delivery
- Review of critical and complex structures
- Information/Guidance development and maintenance
- Research identification and support
- National Highway Institute (NHI) curriculum and training oversight

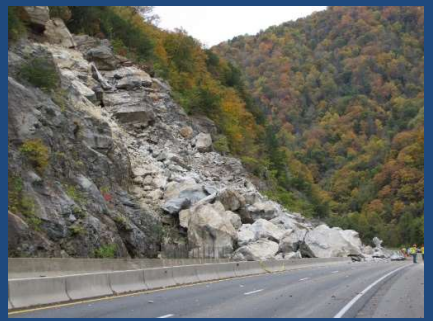
# PROJECT DELIVERY SUPPORT/PROJECT REVIEWS

1. I-695 over Patapsco River/Baltimore Harbor, Francis Scott Key Bridge (MD)
2. I-71/75 over Ohio River, Brent Spence Bridge (OH/KY)
3. I-39/90/94 over Wisconsin River (WI)
4. I-278 BQE Central Project (NY)
5. I-80 Sinkholes - Wharton (NJ)
6. Western Hills Viaduct (OH)
7. Burnside Bridge (OR)
8. Last Chance Grade (CA)
9. Hurricane Helene Response (NC)
10. US-51 over Ohio River (KY/IL)
11. I-195 over Seekonk River, Washington Bridge (RI)

# GEOTECHNICAL TEAM FOCUS AREAS

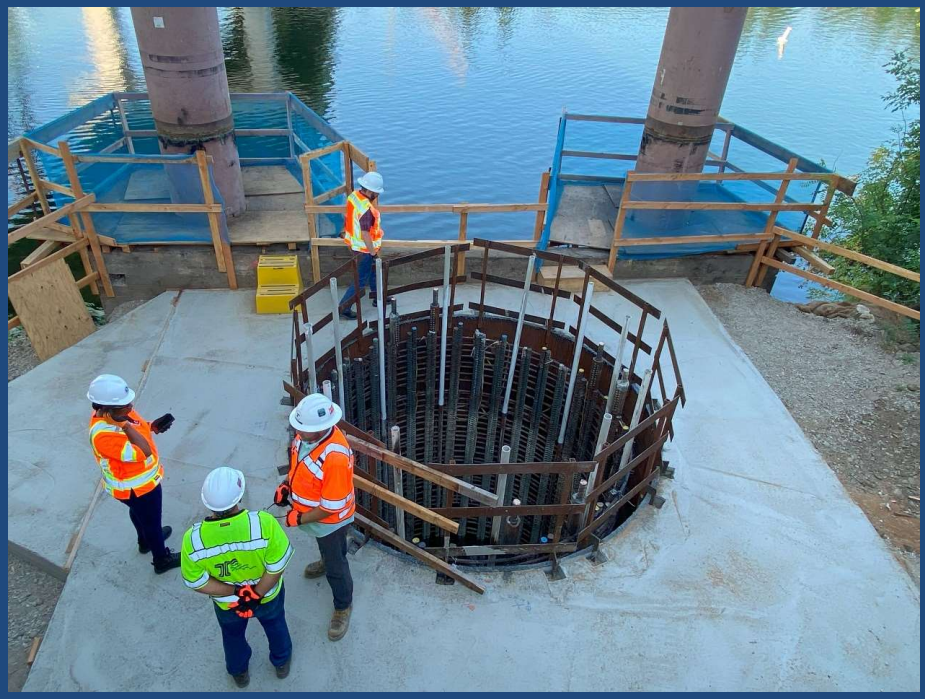
- Innovations in Geotechnical Design and Construction Methods
- Advanced Site Characterization
- Geotechnical Asset and Performance Management
- Geotechnics of Scour
- Geotechnical Aspects of Pavement






# DISCIPLINE CONSIDERATIONS

- Importance of construction means and methods to geotechnical design and performance
  - Size and depth of foundation elements
  - Technique and system innovations
  - Construction control methods for establishing reliability of geotechnical elements
- Continued issues with the application of LRFD to geotechnical applications
  - Strength and service limit state calibration and application
  - Development of probabilistic approaches
  - Geotechnical data as part of asset management
  - Understanding geotechnical performance



# DISCIPLINE CONSIDERATIONS

- Understanding risks associated with not properly characterizing geohazards
  - Value of a properly scoped and executed site investigation program
  - Advances in site investigation tools
  - Influence of investigation/test type and quantity on reliability of geotechnical elements
- Required cross-discipline cooperation
  - Pavements
  - Structures
  - Hydraulics
  - Transportation Asset Management
  - Construction
  - Environment

Source: Harry Moore (Retired TN DOT)

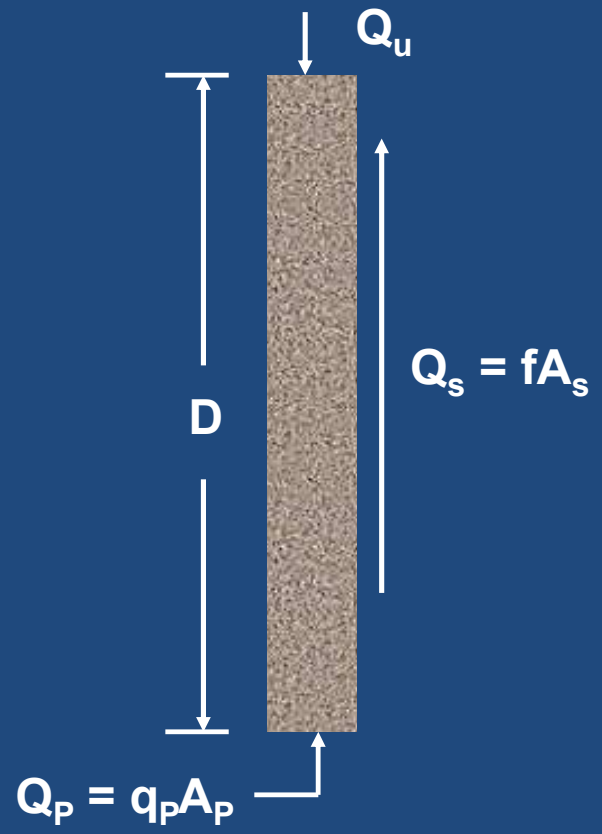
# CURRENT AND PLANNED ACTIVITIES FOR THE GEOTECHNICAL PROGRAM

- Evaluation of LRFD Geotechnical Limit States for Structural Foundations
- Quality Assurance Procedures for Large Diameter Drilled Shafts
- NextScour: Developing Approaches for Determining the Allowable Critical Shear Stress of Clays
- Texas A&M NGES: Evaluation of Exhumed Foundation Elements
- Support for AASHTO Re-Write of Section 10 to Consider the Reliability of Site Characterization Programs
- Liquefaction and Consequences
- Continued Maintenance of Technical Reference Manuals and NHI Training

# EVALUATION OF LRFD GEOTECHNICAL LIMIT STATES FOR STRUCTURAL FOUNDATIONS

Research objective is to evaluate current geotechnical limit states for the design of structure foundations considering:

- Advances in available technology
- More complex design concerns
- Innovations in construction means and methods



# EVALUATION OF QA PROCEDURES FOR LARGE DIAMETER DRILLED SHAFTS

Purpose is to address QA issues related to use of rotator/oscillator drilled shaft installation equipment:

- Differences in inspection procedures vs. traditional installation methods
- Use of drilling fluids with rotator/oscillator drilling
- Maintenance of soil plugs
- Installation plan development

# DEVELOPING APPROACHES FOR DETERMINING THE ALLOWABLE CRITICAL SHEAR STRESS IN CLAYS

FHWA has developed a long-term research strategy (NextScour) to address scour as a complex geotechnical soil-structure interaction problem

- Early phase work has focused on improving simplified, conservative assumptions for scour in cohesive soils
- Development of a framework for defining critical shear stress ($\tau_c$)

# EVALUATION OF EXHUMED FOUNDATION ELEMENTS

Opportunity to decommission the fully characterized "outdoor labs" established by FHWA and NSF at the National Geotechnical Experimentation Sites (NGES) at Texas A&M. Objectives are to:

- Exhume existing foundation elements to evaluate for corrosion and long term concrete and steel performance
- Re-characterize the site for evaluation of current soil properties
- Evaluation and development of testing protocols

Source: Texas A&M University

# RELIABILITY OF SITE CHARACTERIZATION PROGRAMS

Development of implementation aids for use of update to Section 10 of the AASHTO LRFD Bridge Design Specifications.

- Address uncertainty in site characterization by accounting for reliability of the subsurface investigation program
- For static analysis methods, resistance factors will be based on the coefficient of variation of the critical design parameter
- Addresses both direct and indirect measurements for determination of a design parameter

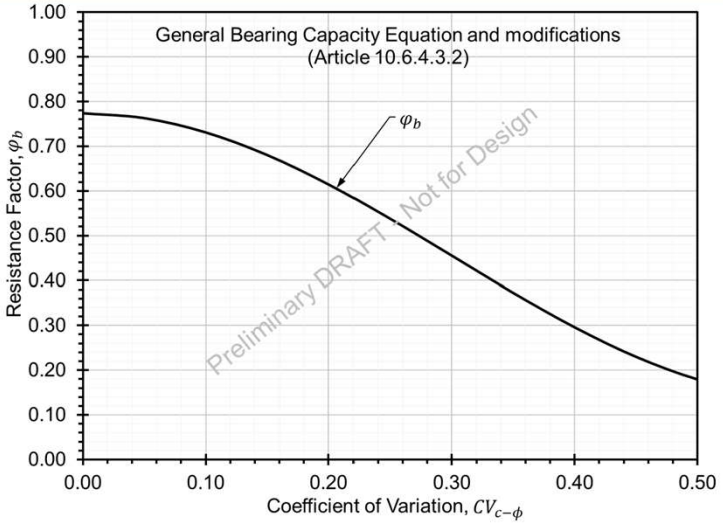
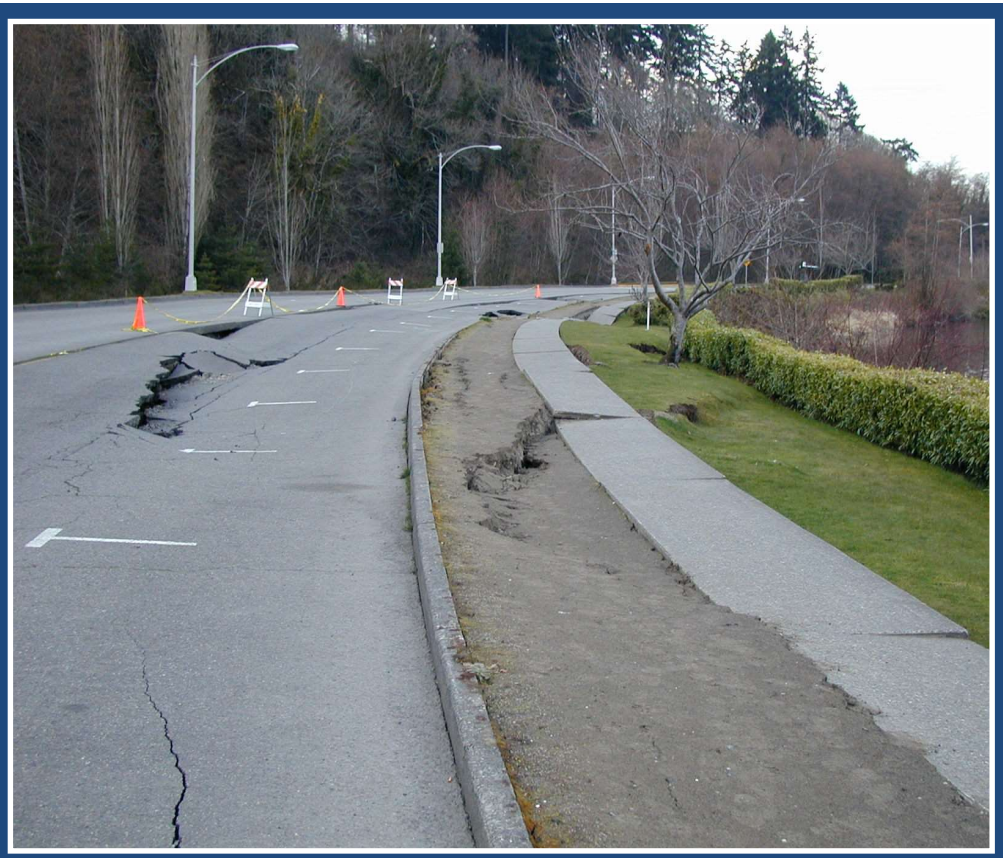



**Figure 10.6.4.3.2-1—Resistance factor for bearing resistance determined using classical bearing capacity theory, including modifications to address punching shear, slopes, and layering (Article 10.6.4.3.2).**

# IMPROVED LIQUEFACTION HAZARD ASSESSMENTS

Research effort around the Next Generation Liquefaction (NGL) project to produce probabilistic models for liquefaction susceptibility

- Goal of improved predictive capabilities
- Current and future tasks to continue data gathering efforts and develop models for:
  - Triggering and Manifestion
  - Lateral Spreading
  - Deep Liquefaction



# NHI GEOTECHNICAL TRAINING

NHI has consistently been our most important communication and technical assistance mechanism. Currently evolving program to:

- Increase methods and opportunities for accessing and delivering training
- Provide improved technical assistance vehicles
- Provide better consistency in training materials and delivery

# CURRENT ACTIVITIES

Geotechnical Engineering Circular (GEC) Developments:

- GEC-2/NHI 132036 – Earth Retaining Structures (Manual and Web-Based Training)
- GEC-16/NHI 132078 – Micropiles (Manual and Instructor Led Training)
- GEC-3 – Seismic Analysis and Design of Geotechnical Features and Structure Foundations (Manual)
- GEC-1 – Geotechnical Fundamentals for Transportation Projects (Manual)

eBook Developments:

- Measurement While Drilling
- Use of the Neutral Plane Method for Evaluating Dragload in Foundation Design
- Evaluation of Tmax for MSE Wall Design

# CURRENT ACTIVITIES

National Highway Institute (NHI) Training Developments:

- NHI 130093 – Earthquake Engineering
- NHI 132012 – Geotechnical Fundamentals for Transportation Projects
- NHI 132036 – Earth Retaining Structures (Web-Based)
- NHI 132069 – Driven Pile Inspection (Web-Based)
- NHI 132070 – Drilled Shaft Inspection (Web-based)
- NHI 132078 – Micropiles

# ACCESS TO NHI TRAINING

- Blackboard Learning Management System (LMS) is live!
  - More interactive and user-friendly platform
  - Easier access to course information
  - Simplified course registration
  - Transcript viewing and management of profile information

# THANK YOU!


Source: Aero Aggregates