
Perspectives on Foundation Engineering for Design-Build Projects

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Considerations with Design-Build

- ◆ Schedule
- ◆ Competitive Price / Best Value
- ◆ Risk Profile

Considerations with Design-Build

◆ Schedule

- ◆ D-B is a *very* effective method to accelerate project delivery
- ◆ Foundations typically critical path item
- ◆ Uncertainties regarding submittal / acceptance hold point items present schedule risk

Considerations with Design-Build

◆ Risk Profile

- ◆ Responsible bidders price the risk
- ◆ Better geotechnical information reduces risk
- ◆ Some risks are best retained by owner

Considerations with Design-Build

- ◆ Competitive Price / Best Value
 - ◆ In the absence of best value selection criteria, low price always wins
 - ◆ One can only bid to meet the stated criteria; the rules must be clear
 - ◆ Value items must be clearly conveyed
 - ◆ Performance criteria

NCHRP

SYNTHESIS 429

Geotechnical Information Practices in Design-Build Projects



A Synthesis of Highway Practice

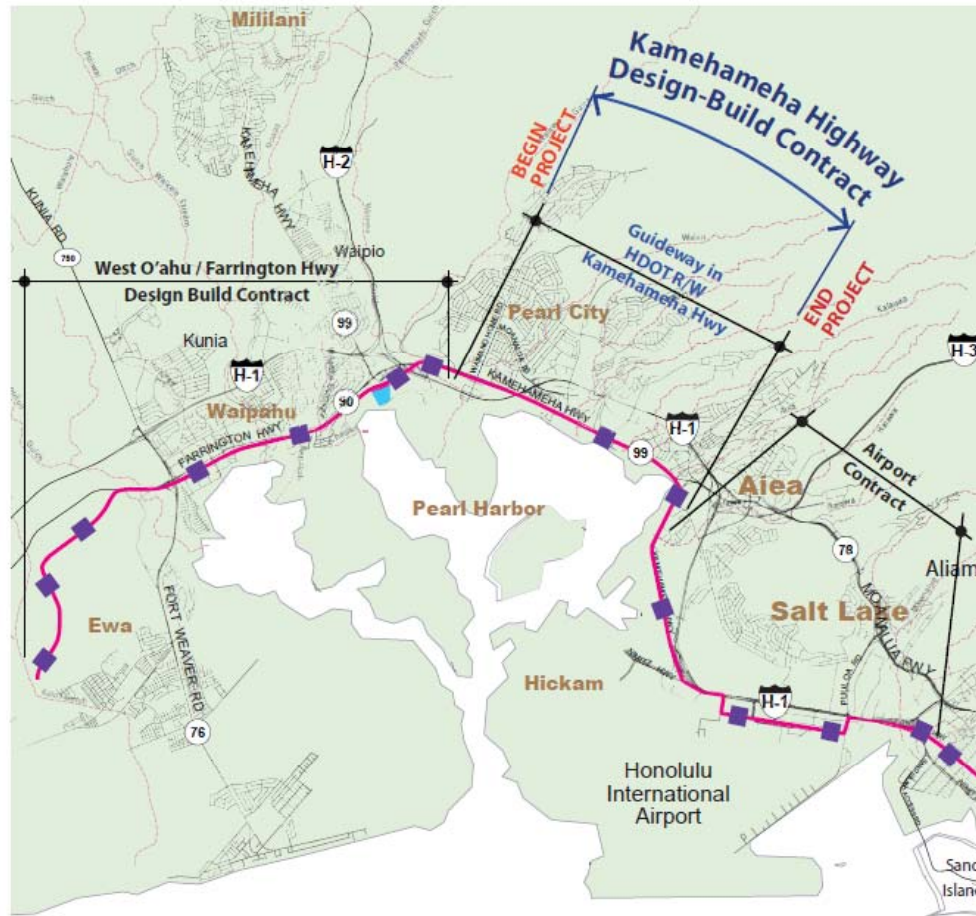
TRANSPORTATION RESEARCH BOARD
OF THE NATIONAL ACADEMIES

NATIONAL
COOPERATIVE
HIGHWAY
RESEARCH
PROGRAM

Example: Honolulu Rail Transit

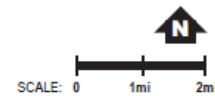
- ◆ Geotechnical Baseline Report
 - ◆ Wide range of varying ground conditions
- ◆ Extensive Performance Testing Requirement
 - ◆ Allowed innovation

Honolulu Rail Project



LEGEND :

- Proposed Alignment
- Proposed Station Locations
- Maintenance and Storage Facility
- Stream / Gulch



Oahu - Geology

Surface Geology on Oahu

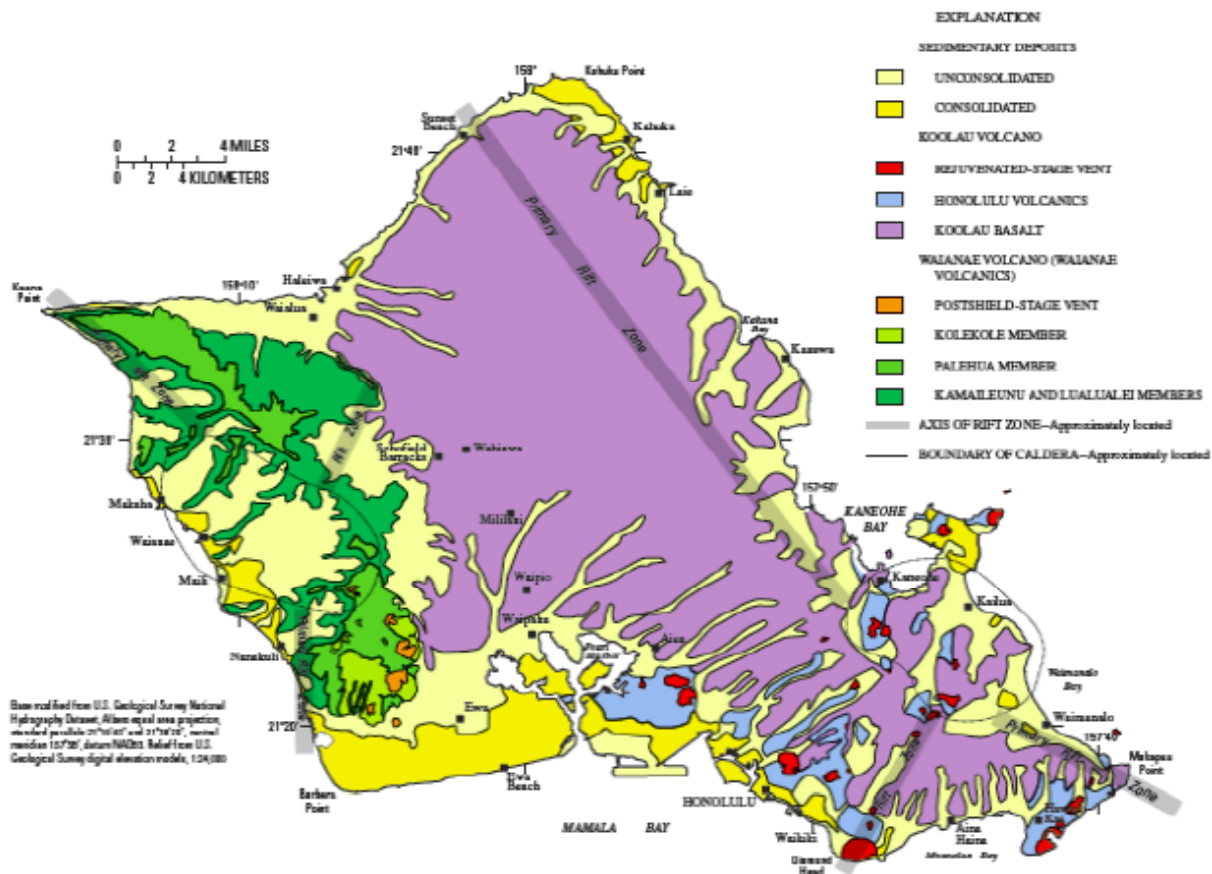
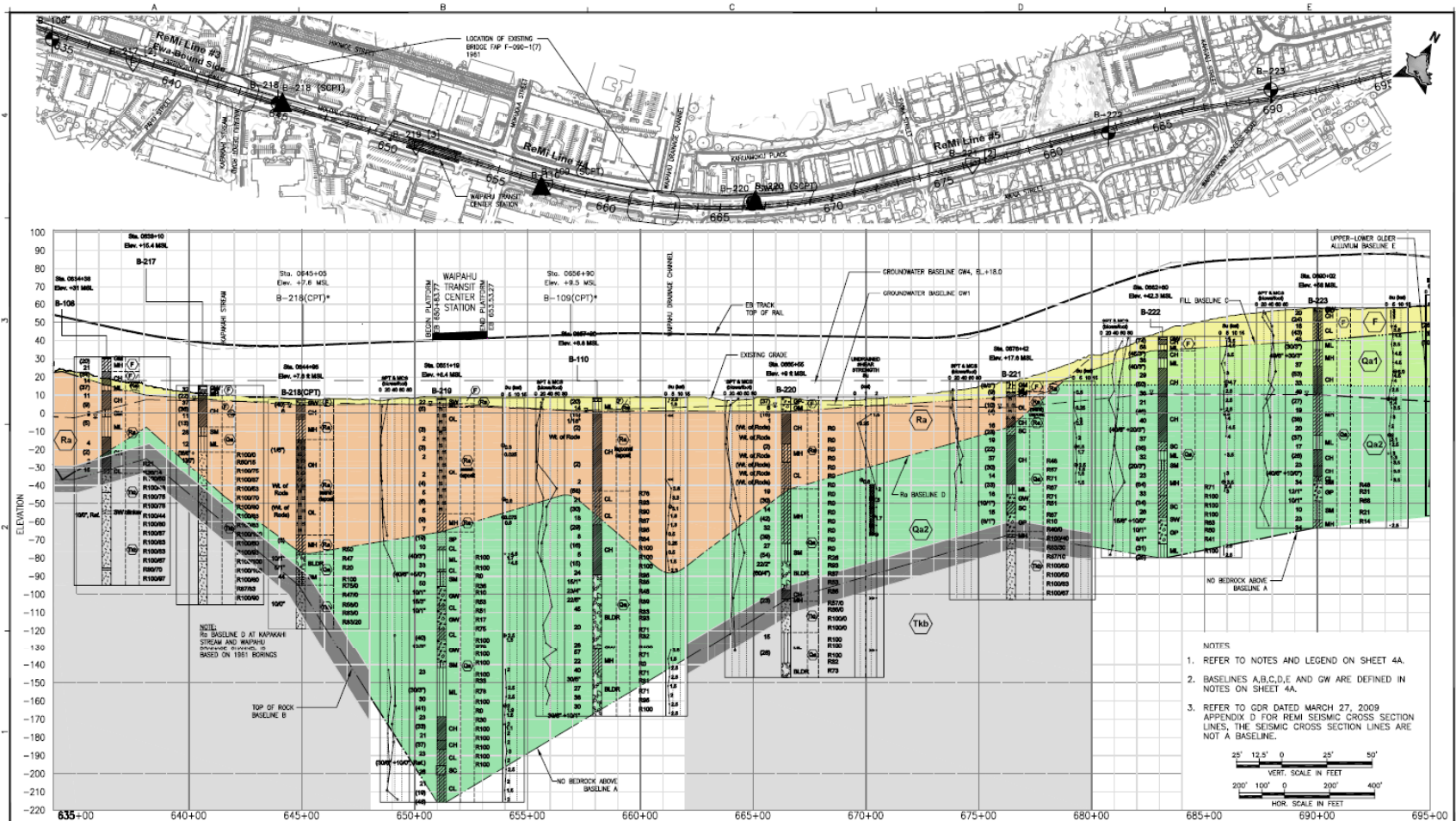


Figure 5. Generalized surficial geology, Oahu, Hawaii (modified from Stearns, 1939; Langenheim and Clague, 1987; Presley and others, 1997).

Anticipated Geologic Materials

- Basalt Formation
- Saprolite (Partially Weathered Basalt)
- Volcanic Tuff (“Mudrock”)
- Coralline Detritus & Coral Formation
- Alluvium (Stiff/Dense Silty Clays & Silty Sands with Variable Amounts of Cobbles & Boulders)
- Recent Alluvium & Lagoonal Deposits (Soft Silty Clays & Loose Silty Sands)

WOFH Ground Conditions



Rev	By	Date	Description

Designed: E. Dayre
 Drawn: J. Morales
 Checked: Z. Batchko
 Approved: A. Borst
 Date: 3-27-09

HONOLULU HIGH-CAPACITY TRANSIT CORRIDOR PROJECT
 CITY & COUNTY OF HONOLULU - DEPARTMENT OF TRANSPORTATION SERVICES - RAPID TRANSIT DIVISION

Prime Consultant: **PB PARSONS BRINCKERHOFF**
 1003 Bishop Street, Suite 2250 - Honolulu, HI 96813
 For reduced prints, original page size in inches.

WEST O'AHU/FARRINGTON DESIGN-BUILD

GEOTECHNICAL PLAN & PROFILE
 EB 630+00 TO EB 695+00

Contract No.:
 Contract No.:
 CAD File:
 Figure No: 4G.1 Rev.
 Scale: AS SHOWN
 Page No. of

14 Load Tests on 11 miles of Guideway



Basalt Formation (Vugular)



Coral Formation



Coralline Detritus (Broken Up)



Volcanic Tuff (“Mudrock”)



Base Grouting in Sand/Gravel/Cobbles



102 FT
3 M SHAFT







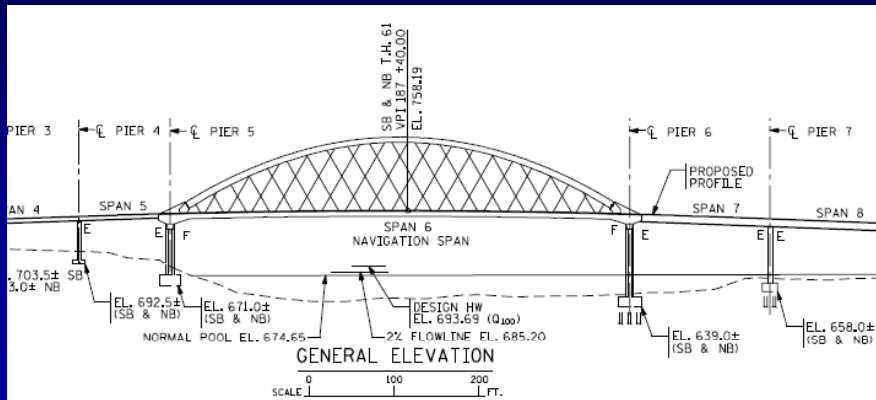
Example: Honolulu Rail Transit

- ◆ Geotechnical Baseline Report
 - ◆ Helped define risks, minimize contingency costs
- ◆ Extensive Performance Testing Requirement
 - ◆ Allowed innovation

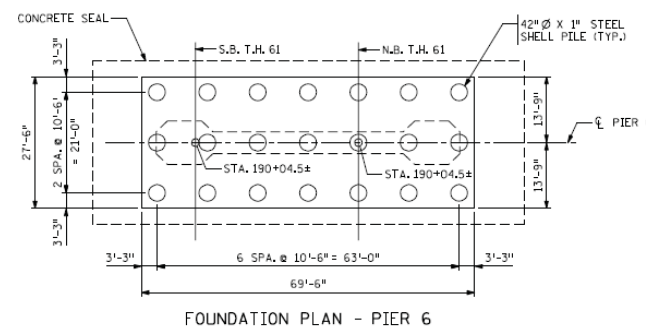
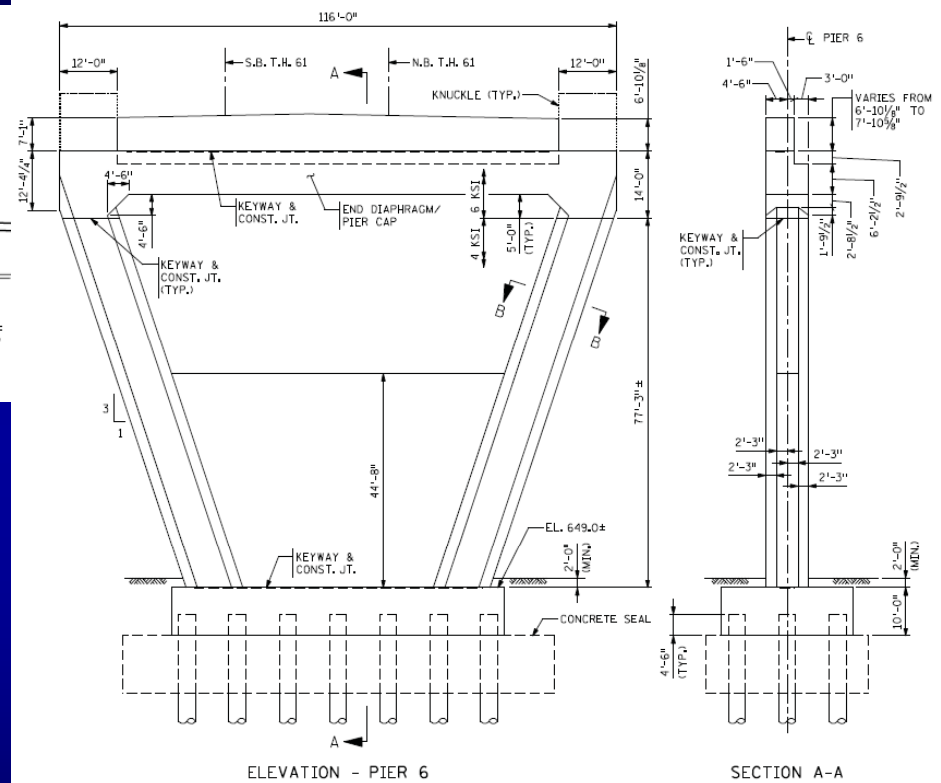
Example: Hastings Bridge, MN

- ◆ Best Value Selection Process
 - ◆ Price / Technical Score
- ◆ Verification of High Capacity Pipe Piles
- ◆ North Abutment Settlement Issue

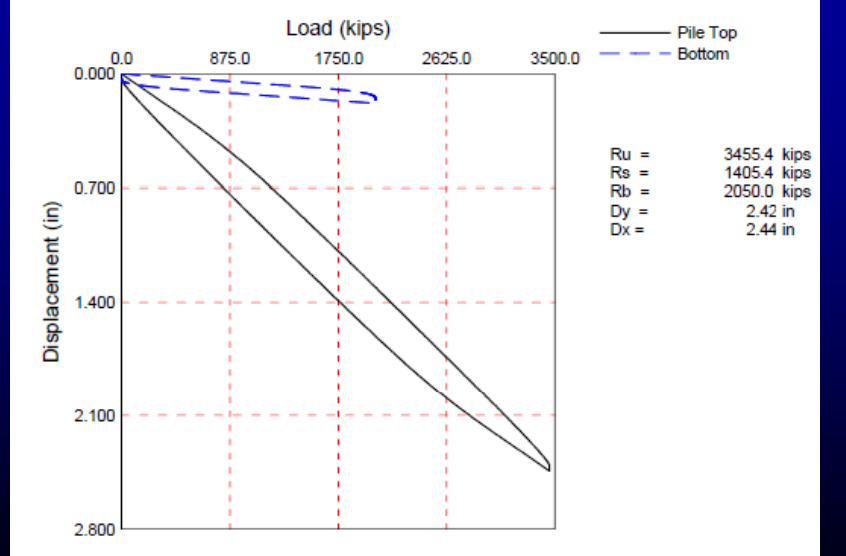
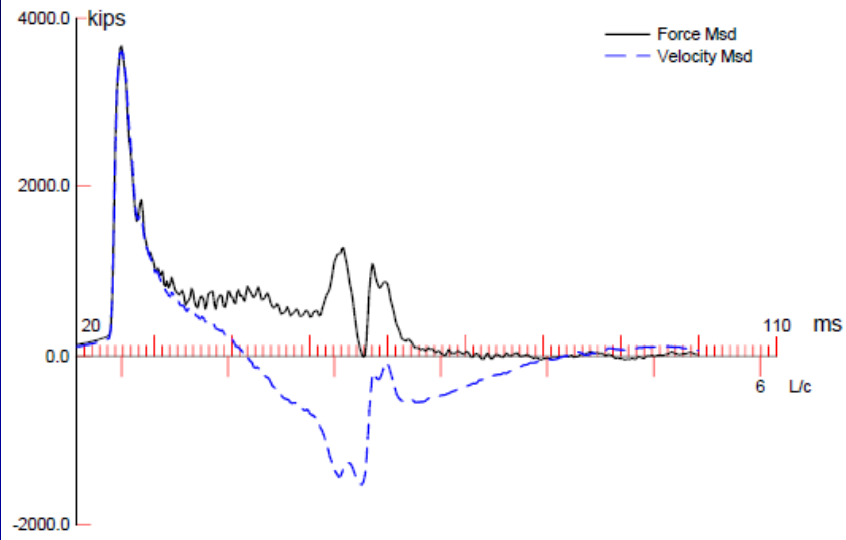
Hastings, MN Steel Pipe Piles



- ◆ 42" dia x 1" x 150'
- ◆ PDA used to monitor driving stress so pile can be driven hard
- ◆ Statnamic axial for verification



Hastings, MN Steel Pipe Piles



Hastings Steel Pipe Pile Testing



Hastings Bridge

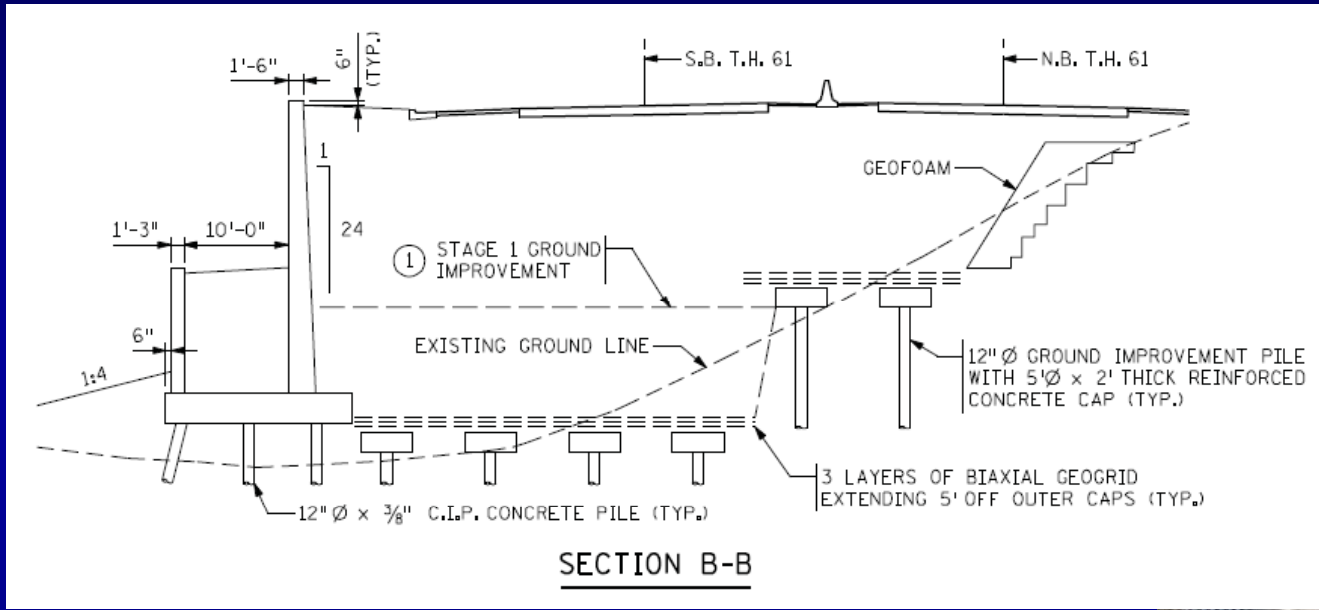
From the RFP:

4.3.3.5.3 Geotechnical (5 Points)

The Proposal shall include a narrative describing the Proposer's approach to managing long-term settlement on the North Approach Segment. Mn/DOT will evaluate the following subfactors:

- ◆ Adequacy of design to minimize long-term settlement on the North Approach Segment
- ◆ Adequacy of construction validation of settlement criteria to minimize long-term settlement on the North Approach Segment

Pile Supported Embankment



Pile raft thru soft clay at
North Embankment



Pile Supported Embankment



Hastings Bridge



Photo from the Star-Tribune

Some Key Conclusions of NCHRP 429

- ◆ Qualifications & Experience of DB Geotechnical Team is key to quality
- ◆ Geotech reviews affect schedule; use over-the-shoulder reviews to expedite schedule
- ◆ Weight geotechnical factors appropriately to the importance to project success
- ◆ Use ATC's to allow bidders to reduce risk

Some Key Conclusions of NCHRP 429

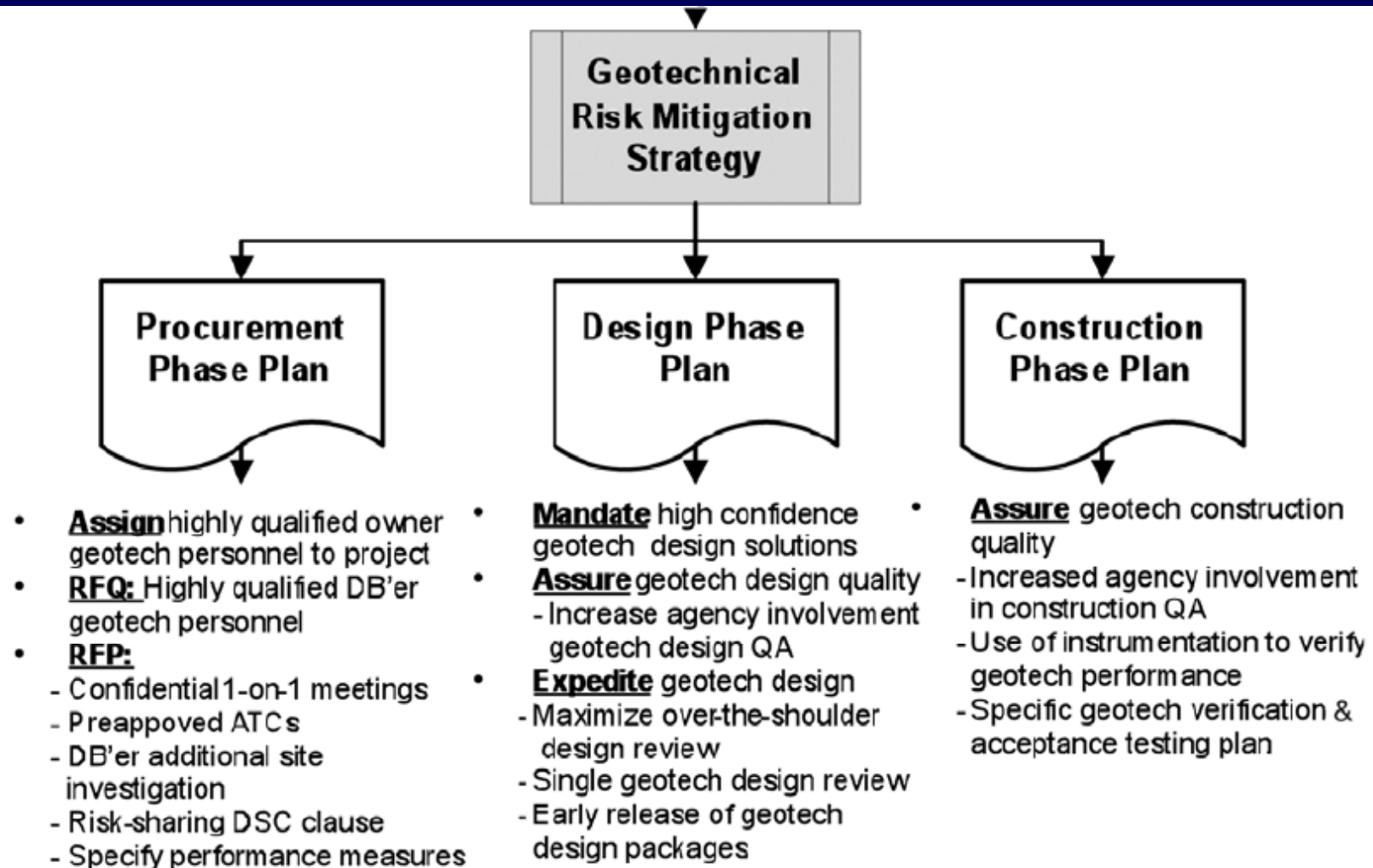


FIGURE 13 Design-build geotechnical decision process based on the conclusions and effective practices.

Summary

- ◆ Geotechnical issues can be critical to success of Design-Build projects;
 - ◆ Schedule-costs-risks
- ◆ RFP should reflect value of geotechnical aspects
- ◆ Manage risks with quality prebid geotech data, GBR, DSC clauses

Summary

- ◆ Agencies can encourage good performance with:
 - ◆ High value on geotech qual's
 - ◆ Clear performance requirements, QA
 - ◆ ATC's