

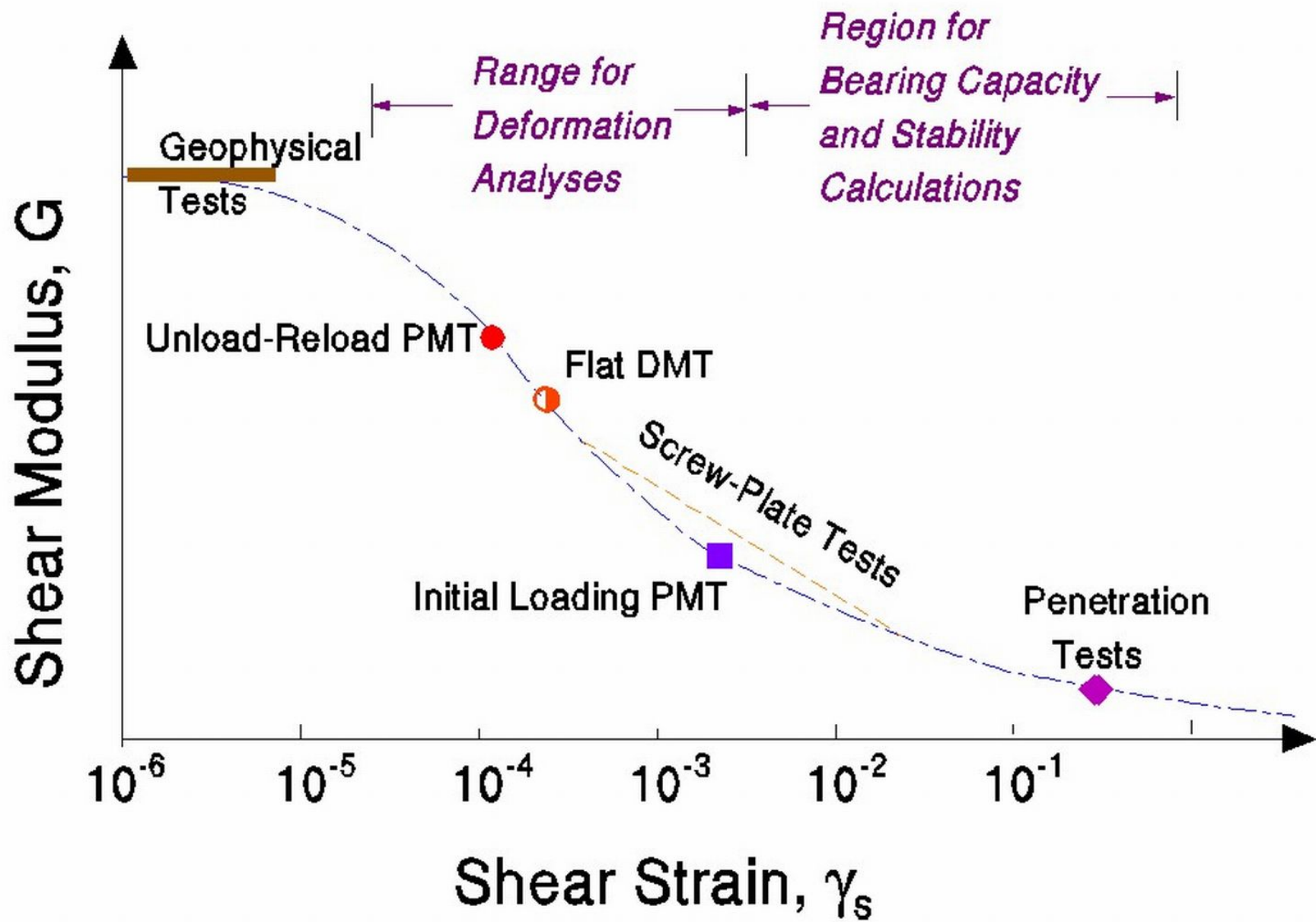
DMT Testing for Redesign Using Shallow Foundations

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Outline

- ❑ Pitfalls of SPT and CPT for Settlement Prediction
 - ❑ Why DMT—The Calibrated Static Stiffness Test--should be used
 - ❑ Case Studies
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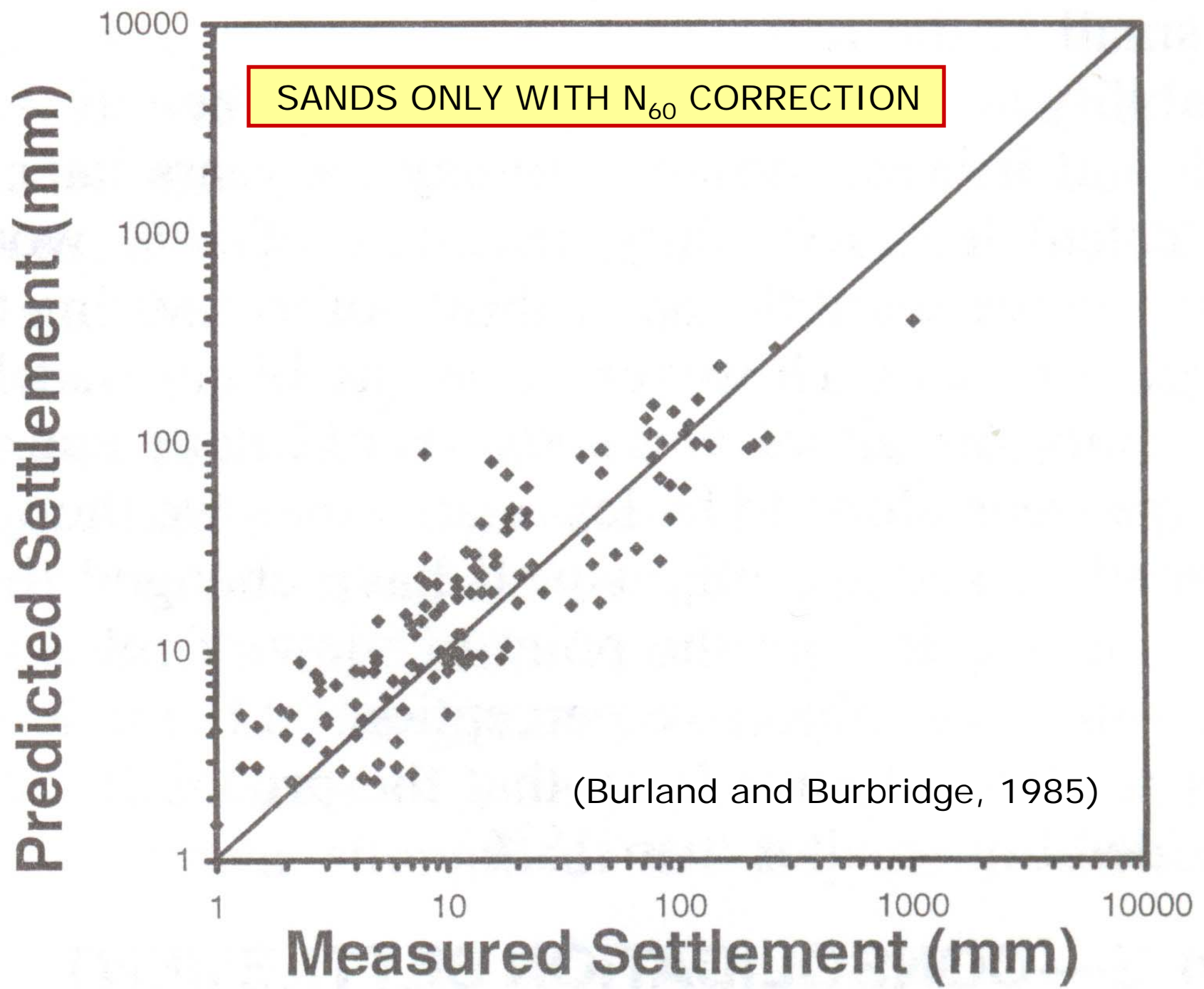
(Mayne, 2001)

Pitfalls of SPT for Settlement

- Hammer Energy—30 to 95% of Theoretical Potential Energy
 - -Operator Dependent
 - -Rarely Calibrated
 - Measurement Noise (Test Repeatability) Up to 100%
 - Non-Calibrated High-Strain Dynamic Test
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Changes to SPT Since 1940s

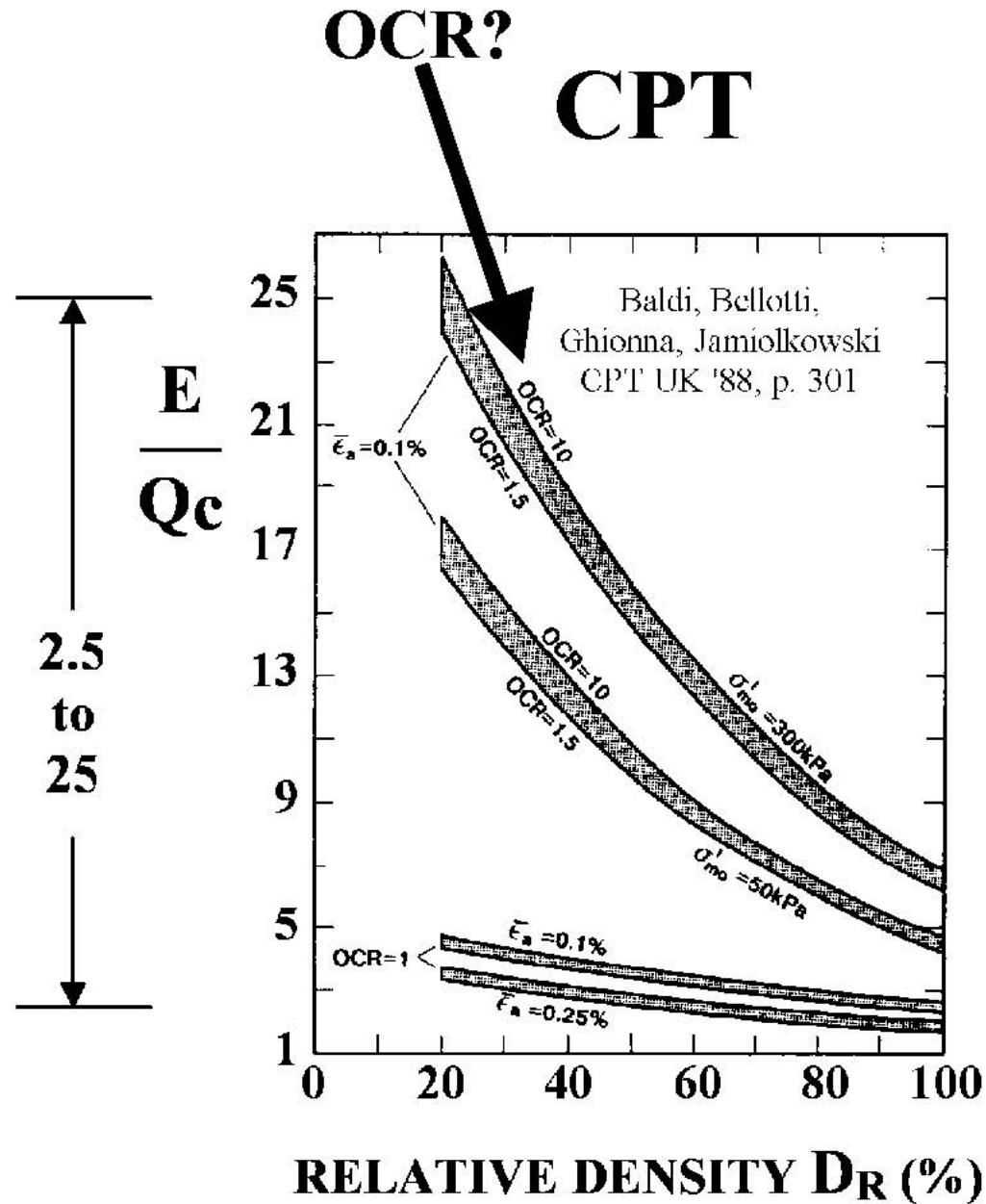
- ❑ Automatic Hammers 55% more Efficient than Safety Hammers
 - ❑ ID of Barrel is Larger than Tip to Accommodate Liners, But Liners rarely used
 - ❑ Hollow Stem Augers remove all existing Geostatic Stresses versus Mud Rotary Drilling
 - ❑ Today's N-value can be $\frac{1}{2}$ of 1940 N-value
 - ❑ Need to Correct to N_{60} -values
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SPT Prediction Error

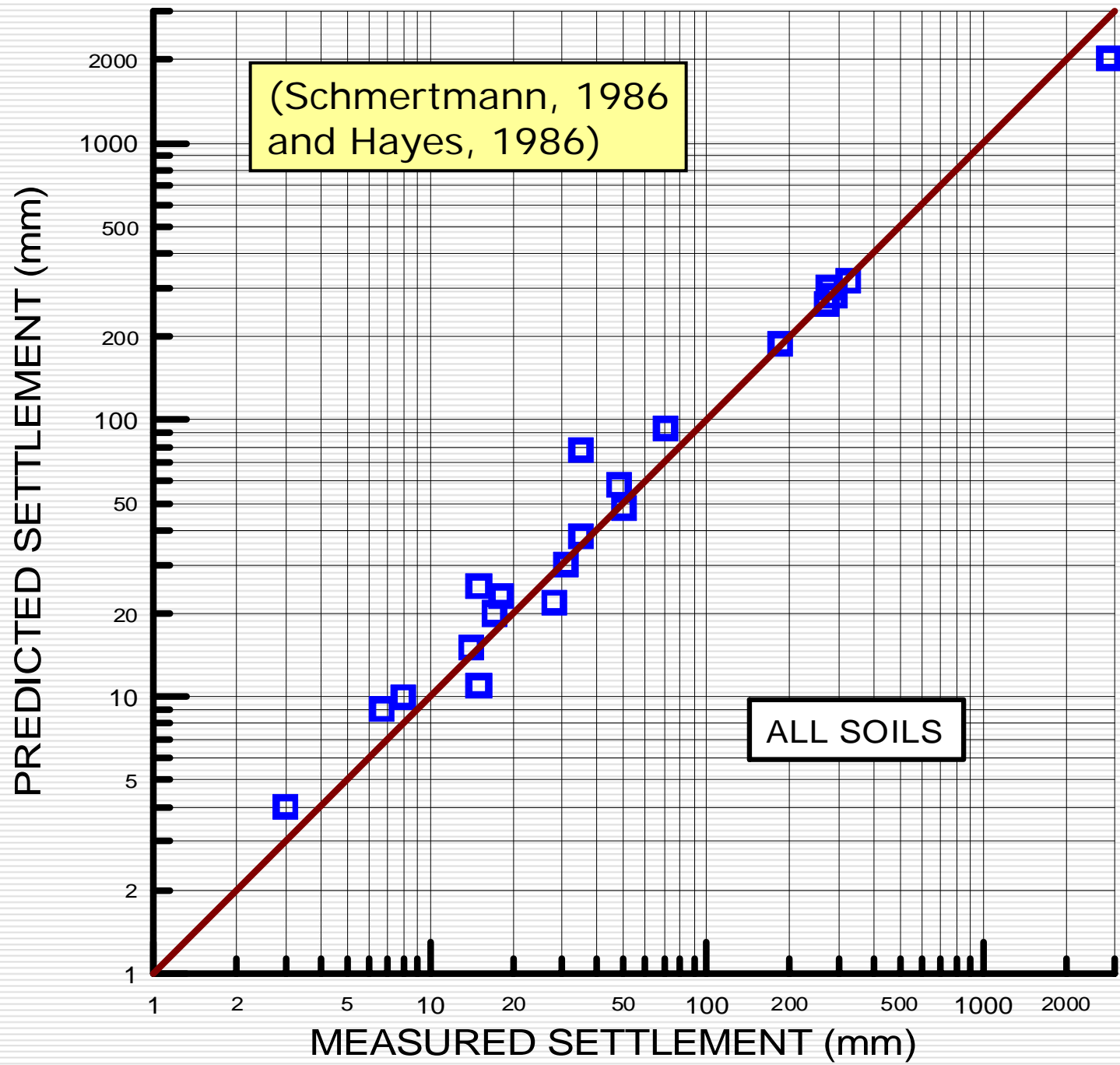
- ❑ Burland and Burbridge Method has Coeff. of Variation (standard deviation/average) = 0.67
 - ❑ Duncan (2000) \Rightarrow Average Settlement \leq 0.30 inch (8 mm) for Max Settlement < 1 inch (25 mm)
 - ❑ Failmezger (2001) \Rightarrow Average even lower when consider test repeatability and subsurface variability
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Pitfalls of CPT for Settlement



Benefits of DMT for Settlement

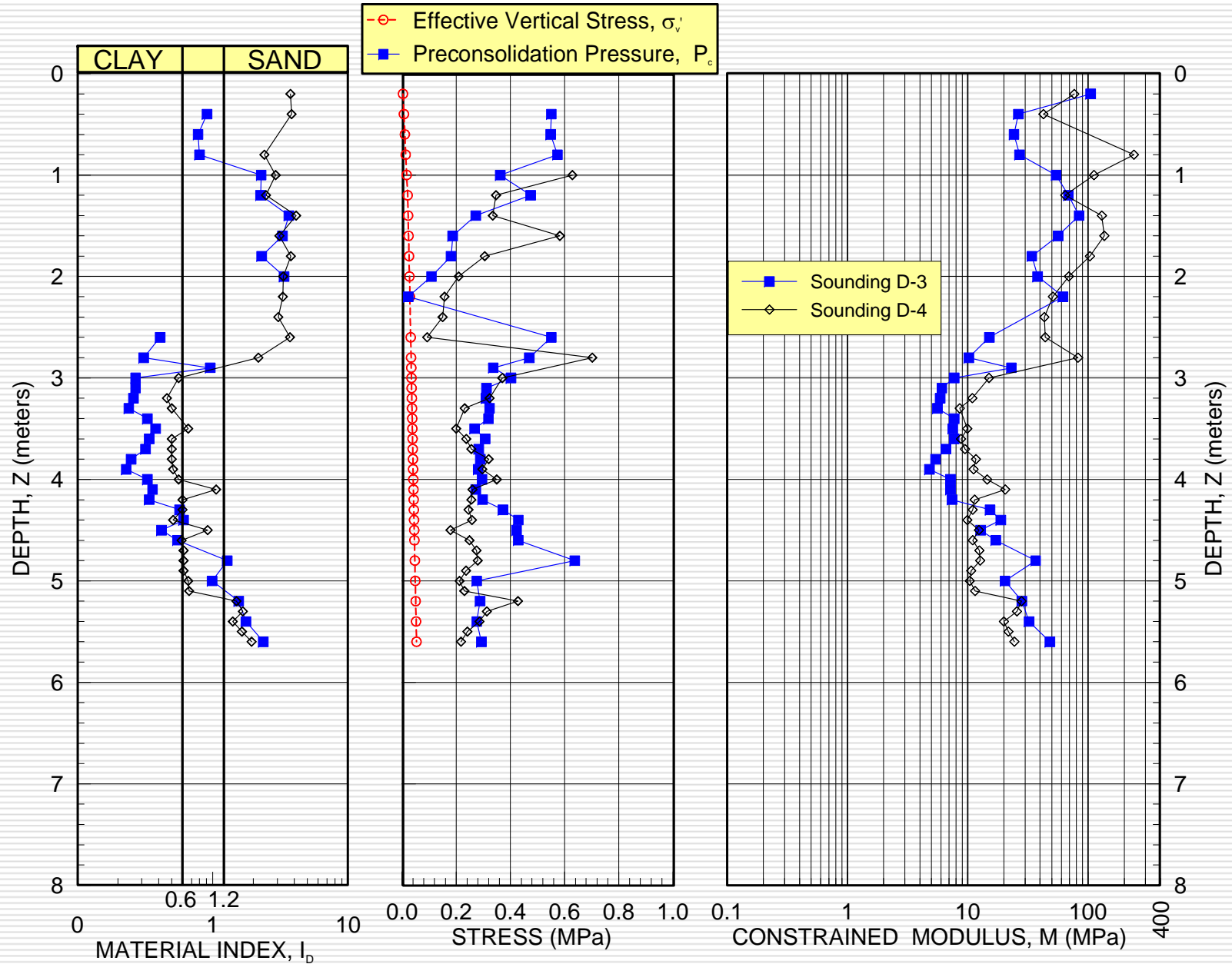
- Calibrated Static Deformation Test at the “Operative” Strain Level and at Close Depth Intervals
 - Case Study Data
 - Average Predicted to Measured Value = 1.06
 - Standard Deviation = 0.18
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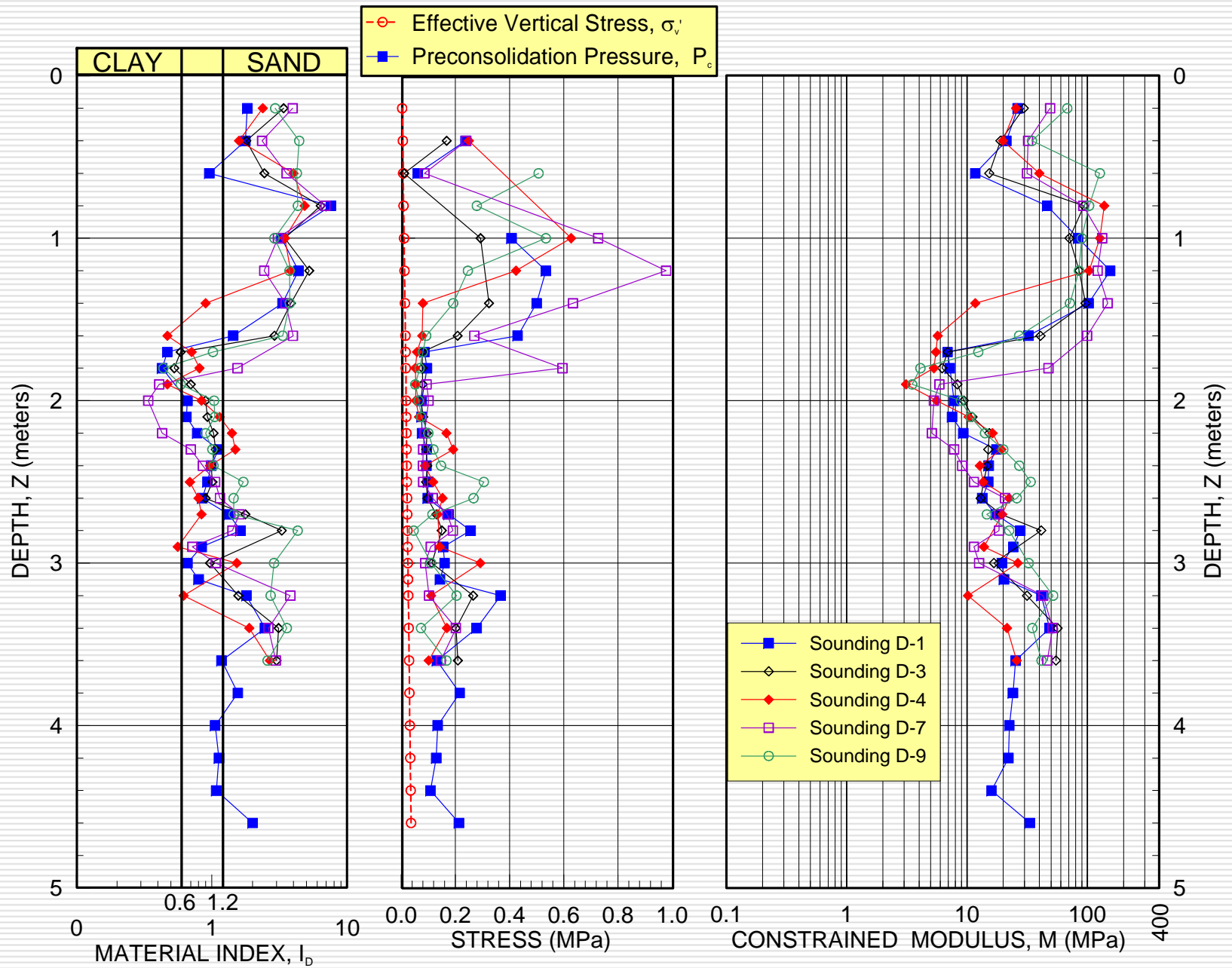
Case Studies

Site	Column Load (kips/kN)	First Engineer's Recommended		DMT Redesign Recommendation	
		Bearing Capacity (psf/kPa)	Predicted Settlement (inches/mm)	Bearing Capacity (psf/kPa)	Predicted Settlement (inches/mm)
Westminister Village	90 [400]	1000 [48]	1 to 4 [25-100]	1500 [72]	< 1.0 [<25]
Walmart Store at Ocean Landing Shopping Center	60 to 160 [267 to 712]	1000 [48]	2.5 [64]	2000 [96]	0.5 [13]
Old Town Crescent	250 [1112]	3000 [144]	3 [75]	5000 [239]	< 0.5 [<13]
Fox Run Village - Novi, Michigan	300 [67]	2000 [96]	3 to 5 [75-125]	4000 [192]	< 1.0 [<25]
Monarch Landing - Naperville, Illinois	200 [45]	2000 [96]	> 1 [>25]	6000 [287]	< 1.0 [<25]

Westminister Village



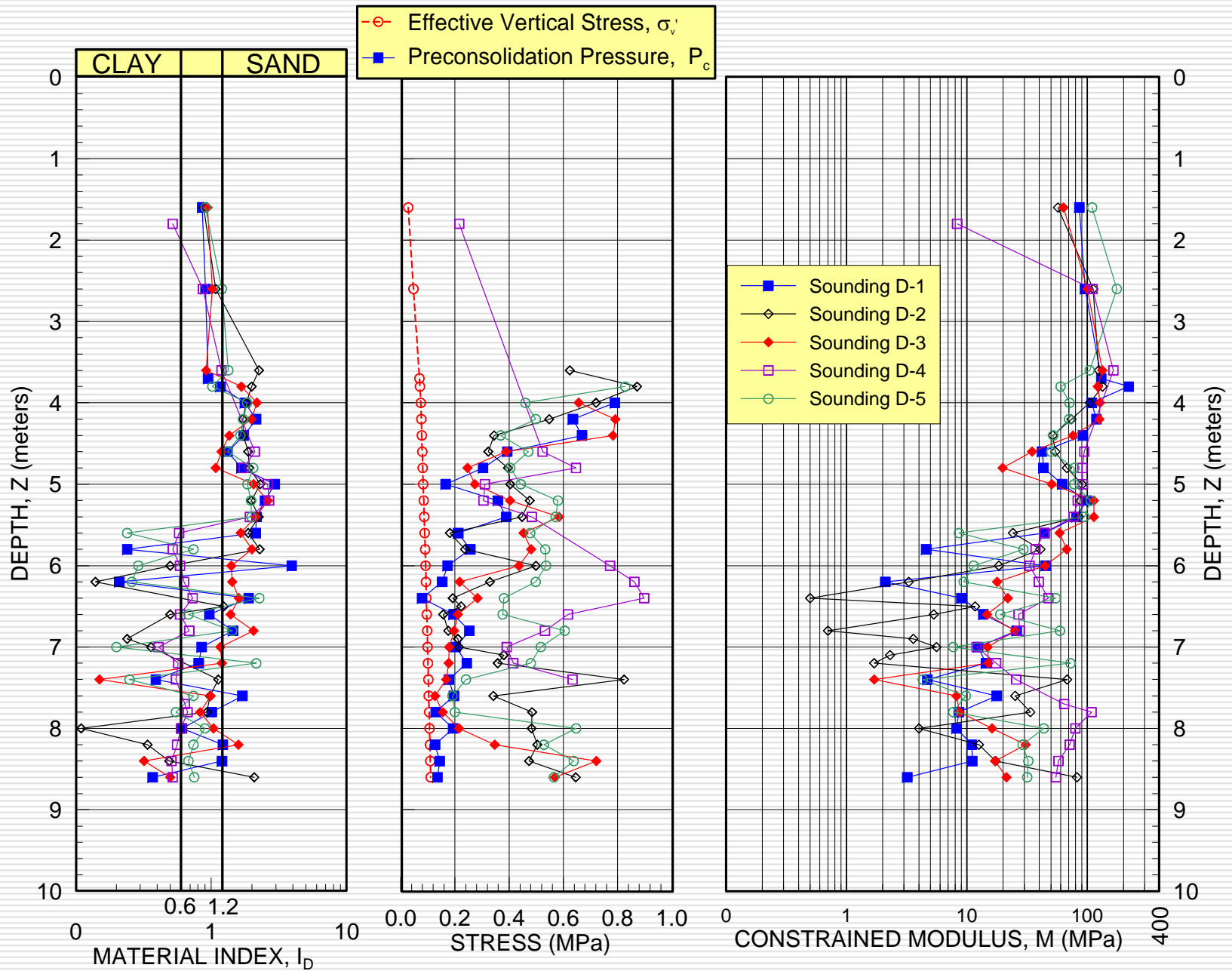
Walmart Store at Ocean Landing



Walmart Store at Ocean Landing



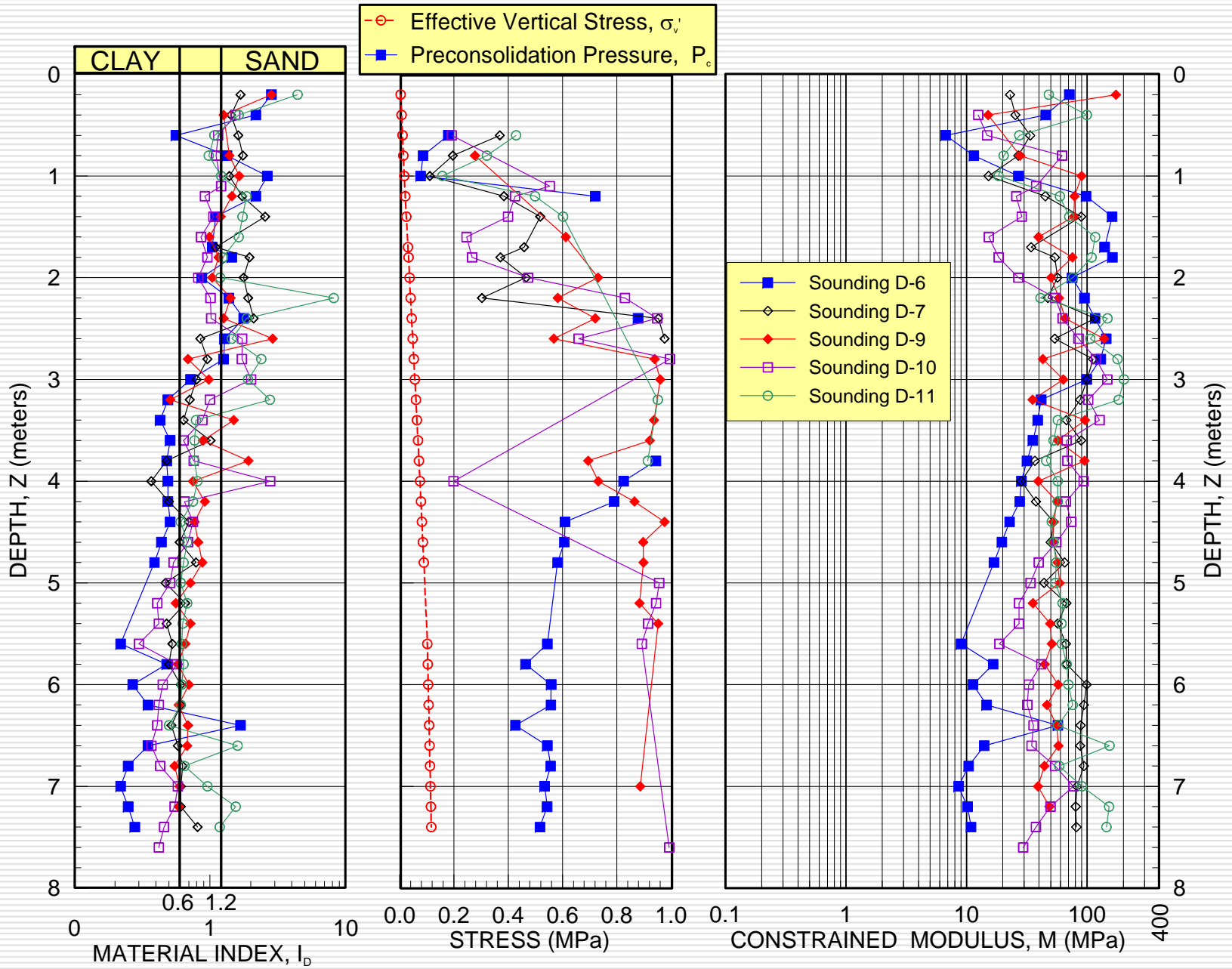
Old Town Crescent



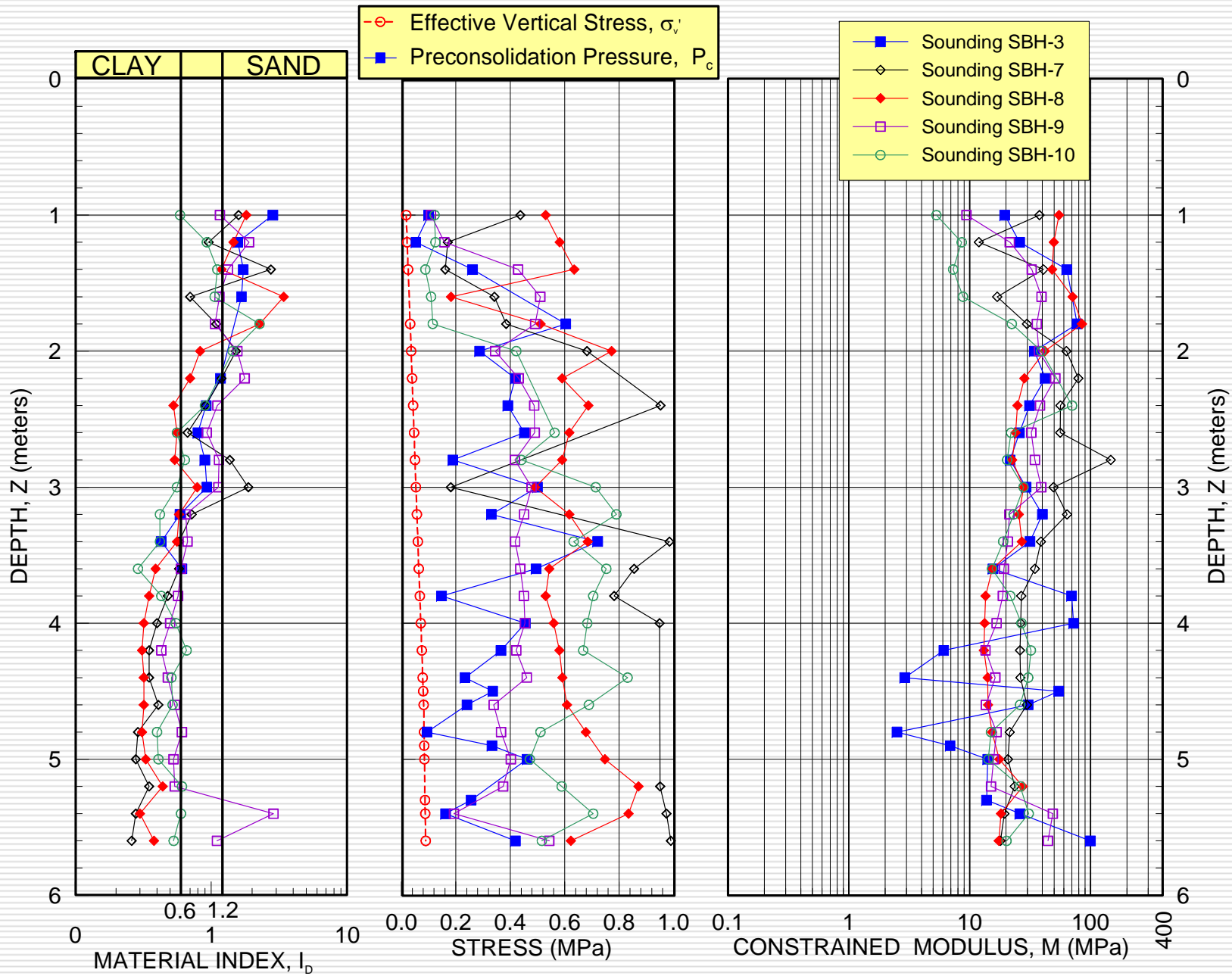
Old Town Crescent



Fox Run Village



Monarch Landing



Conclusions

- ❑ Today engineers' biggest mistakes are recommending a costly foundation solution without adequate data to prove that this solution is necessary
 - ❑ Standard penetration test data should never be used to predict foundation settlements for any soil
 - ❑ CPT is not much better
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Conclusions (cont.)

- Accurate settlement predictions can be made using dilatometer test data
 - The dilatometer is not an expensive in-situ test, and the appropriate interpretation of the testing data can save quite a lot of money in the foundation design, as presented in the five case studies
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