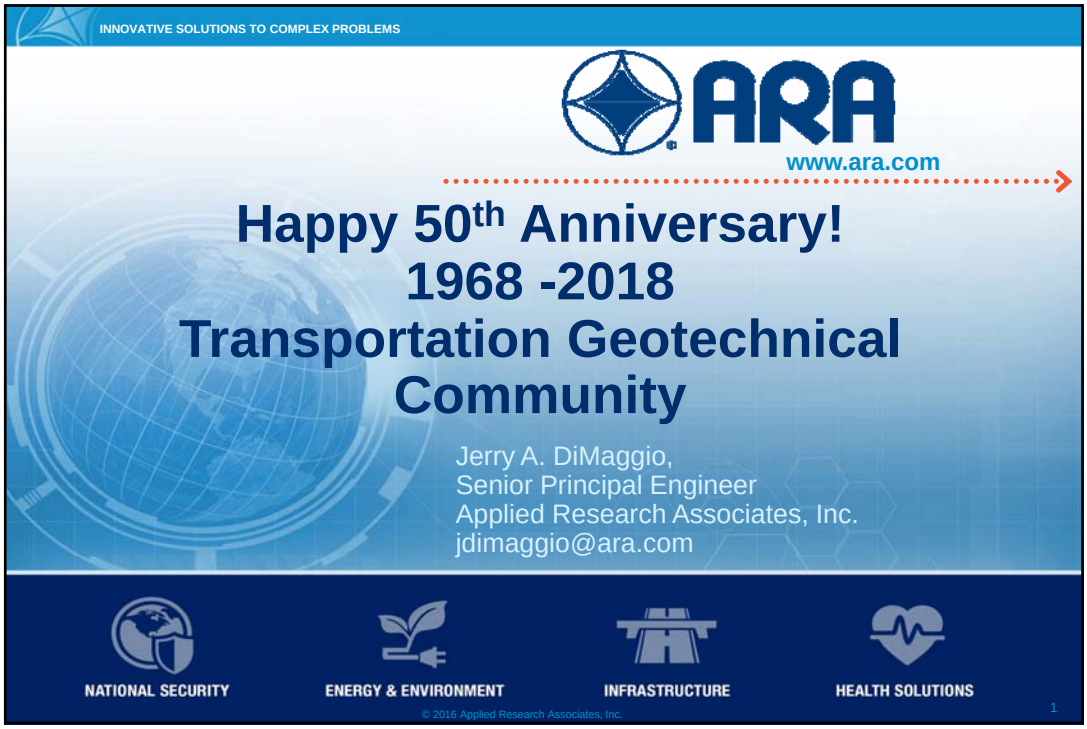



## Presentation Topics

- Background
- Agencies and persons
- Soil and rock parameters
- Subsurface Investigation Details
- Engineered Earthworks
- Earth Retaining structures
- Shallow Foundations
- Deep Foundations
- Pavements
- Geosynthetics

## BUZZ WORDS with staying power in 2017!

- Risk Assessment and Management
- Asset Management (TAMP)
- Performance Measures ?
- Design Life ?
- Serviceability Design ?
- Predicted Remaining Service Life?
- Sustainability
- Longevity

## PROJECT DELIVERY TOOLS

- D-B-B
- D-B
- CM-GC
- P3
- VALUE ENGINEERING
- ATERNATIVE TECHNICAL CONCEPTS
- CONSTRUCTABILITY REVIEWS
- RISK MANAGEMENT REVIEWS
- COST ANALYSIS REVIEWS

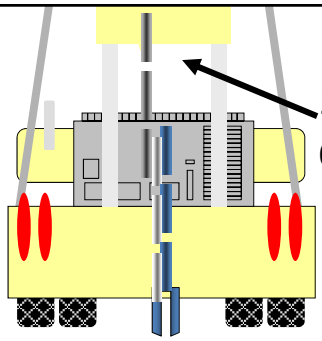
## Identification, Description and Classification of Soils

- **Identification**
  - Process of determining the components of a given soil, e.g., gravel, sand, silt, clay, etc.
- **Description**
  - Process of estimating the relative percentage of each component of soil
  - Description includes identification
- **Classification**
  - Laboratory based process of grouping geomaterials with similar engineering characteristics into categories

Standard Penetration Test

**Typical Values**

$\phi'_f = 25^o - 45^o$




**SPT Resistance (N-value) = 6 + 6 = 12**

**6 blows for 6”**
**6 blows for 6”**
**6 blows for 6”**

8

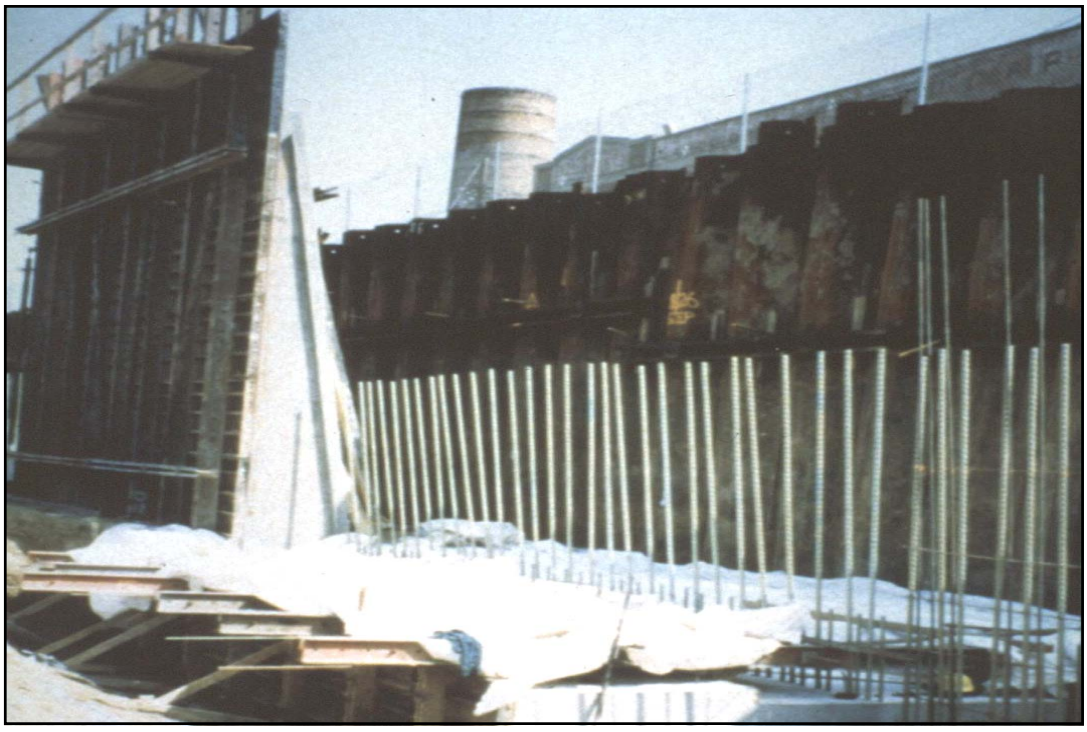
$$\Sigma \eta_i \gamma_i Q_i \leq R_r = \phi R_n$$

| | | |
|---|---|---|
| $\eta_i$ | = | **Load modifier (eta)** |
| $\gamma_i$ | = | **Load factor (gamma)** |
| $Q_i$ | = | **Force effect** |
| $R_r$ | = | **Factored resistance** |
| $\phi$ | = | **Resistance factor (phi)** |
| $R_n$ | = | **Nominal resistance** |

9

## Internal Deformations

# External Deformations



**EARTH RETAINING STRUCTURES**

**Externally Stabilized**

**In situ walls**

**Structural**
(Cut Walls)
Sheet-pile*
Soldier pile-lagging*
Cast-in-situ
- Slurry walls
Bored pile
- Contiguous
Tangent pile
Secant pile
- Non contiguous

**Chemical**
(Cut Walls)
Jet grout
Deep Soil Mix

**Braced**
Cross-lot
Rakers

**Anchored**
Augered
Belled
Pressure injected

**Gravity walls**

**Cast-in-place Concrete**
(Fill Walls)
Cantilever
Counterfort
Buttress

**Modular Gravity**
(Fill Walls)
Masonry
Crib
Bin
Gabion
Concrete Module

**Internally Stabilized**

**Mechanically Stabilized**
(Fill Walls)
Metallic and polymeric
reinforcing strips,
grids and sheets
Anchored Earth
Reinforced Soil Slopes

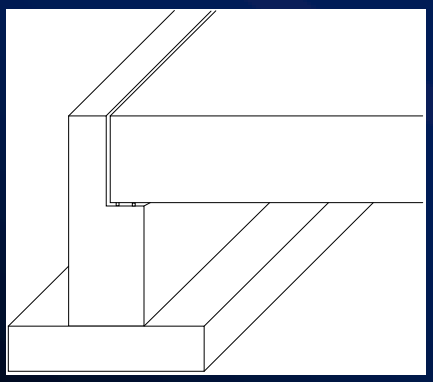
**Hybrid Walls**
Tailed Segmental
Low density Fills

**In situ Reinforced**
(Cut Walls)
Soil Nailing
Reticulated Micro Pile

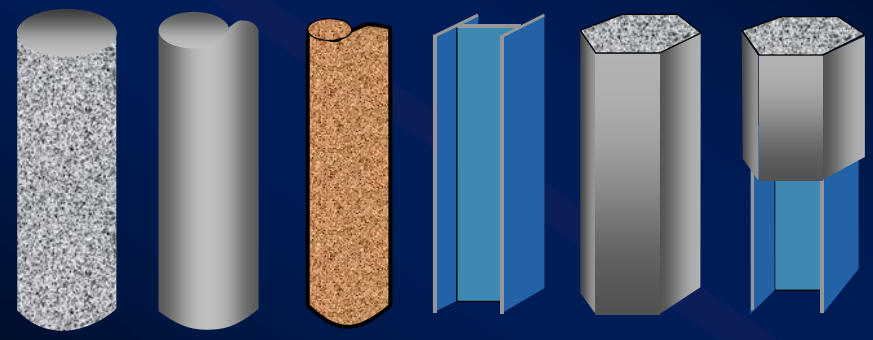
15

* can also be used in fill conditions

# Shallow Foundations

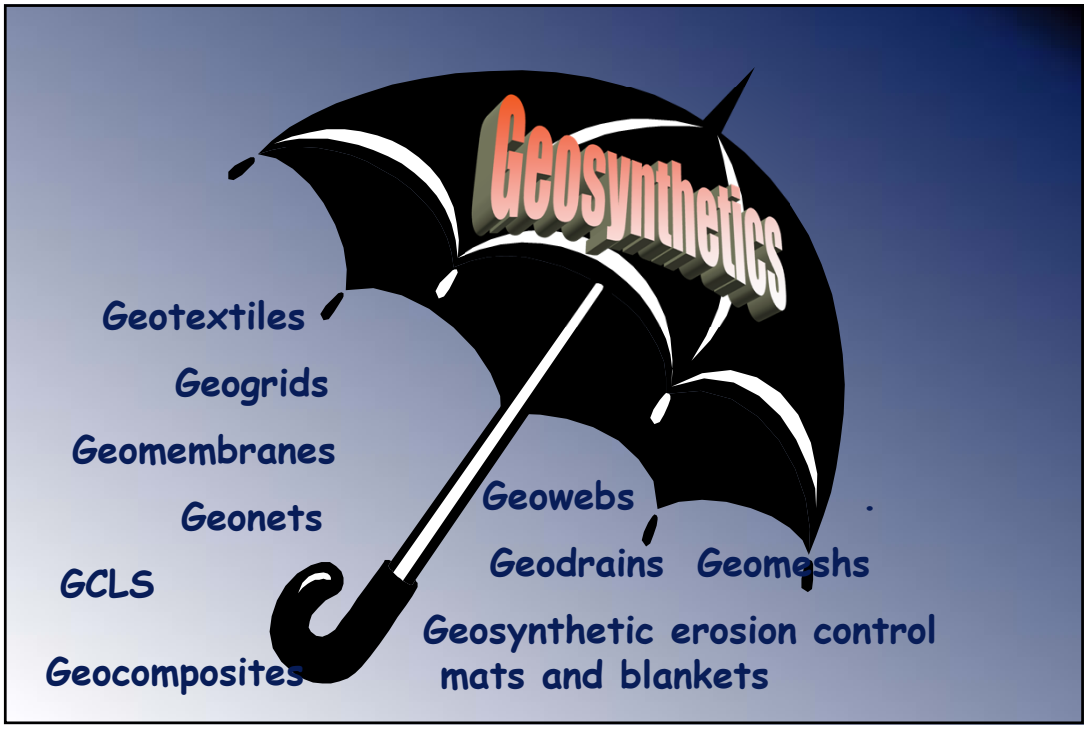


## Pile Types



Concrete | Steel Pipe | Timber | Steel H | Pre-cast Concrete | Composite

## Geotechnical Issues in Pavement Design and Performance


Geosynthetics
Geotextiles
Geogrids
Geomembranes
Geonets
GCLS
Geocomposites
Geowebs
Geodrains
Geomeshs
Geosynthetic erosion control
mats and blankets

What ground improvement
techniques are available?

## *Ground Improvement Categories*

- *Consolidation*
- *Load Distribution*
- *Soil Densification*
- *Reinforcement*
- *Chemical Alteration*
- *Load Transfer*

## Thank You for Your Attention!

jdimaggio@ara.com

**Any Questions?**

22