# FIELD TESTING AND CALIBRATION OF THE VERTICAL INSITU PERMEAMETER (VIP)

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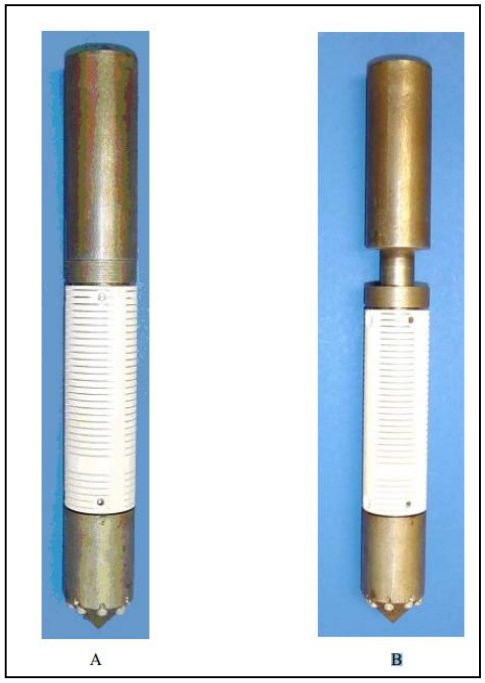
# OVERVIEW

- Background
  - VAHIP
  - VIP
- Project Objective
- Literature Review
  - Direct-Push Permeameter
- Site Identification
  - Lake City
  - Jacksonville
- VIP Testing

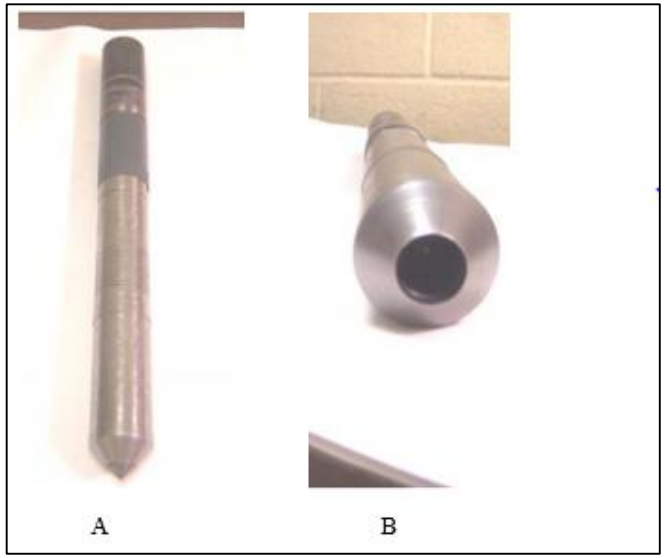
# BACKGROUND

- VAHIP – Vertical and Horizontal Insitu Permeameter
  - Sponsored research by FDOT
    - Insitu hydraulic permeability device
      - Measure permeability in more time-efficient manner than current borehole methods
    - Developed to measure horizontal and vertical permeability
  - 2004 – preliminary probe
  - 2005 to 2007 – updates on the probe
  - 2012 – “smear proof” probe

# BACKGROUND




Original (2004) VAHIP showing:
(A) vertical testing position
(B) horizontal testing position




Evolution of the VAHIP showing the 2005-2007 second generation model:
(A) the horizontal flow position
(B) the vertical flow position

Third generation:
“smear-proof” VAHIP

# BACKGROUND

- VAHIP
  - Difficult operation
  - Development of  VIP
- VIP – Vertical Insitu Permeameter
  - Measures only vertical permeability
  - Improvement compared to existing insitu techniques for permeability measurement
    - Allows testing at several depths using SPT rig

# VAHIP & VIP

## VAHIP

## VIP

# BACKGROUND

- Preliminary field trial tests with VAHIP and VIP
  - Already performed
  - Not yet performed
    - Systematic field testing
    - Validation / Calibration at multiple sites
      - Existing independent permeability estimates from current FDOT borehole methods

# PROJECT OBJECTIVE

- Implement simple procedure to execute the test insitu
- Develop simple and theoretically consistent equations for VIP data interpretation
  - Empirical data analyses comparing VIP data with FDOT borehole data
- Provide user friendly spreadsheet implementation
- Tasks:
  - Literature review
  - Site identification
  - VIP testing
  - Data analyses and empirical equations development
  - Draft and final reports

# LITERATURE REVIEW

- Current methods
  - Laboratory
    - Soil disturbance
    - Sample size
  - Empirical
    - Assumptions
  - Field
    - Insitu measurement
    - Larger sample size
    - Limitations
      - Time
      - Complex procedures

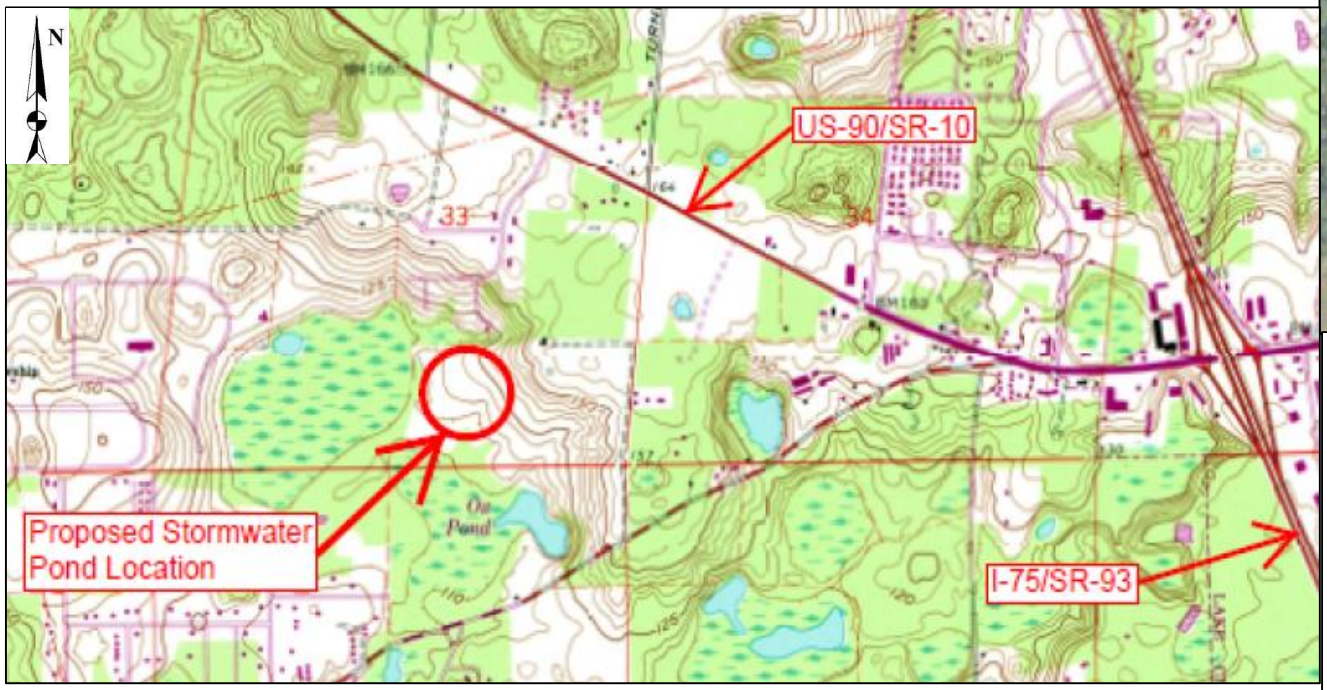
# LITERATURE REVIEW

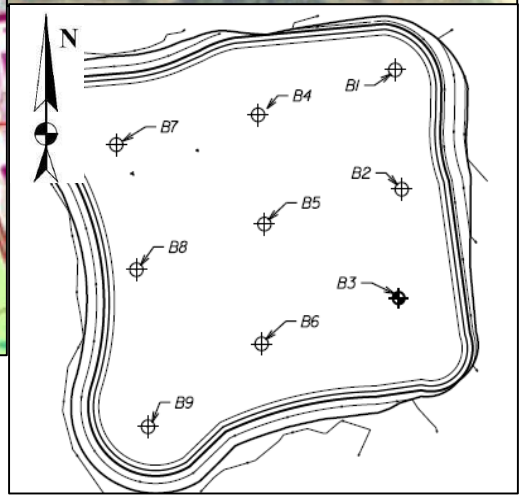
- Development of direct-push permeameter
  - Faster setup and testing times
  - Simplified procedure
  - Less soil disturbance
  - More detailed hydraulic permeability measurement
    - Multiple depths
    - More accurate
    - Vertical and horizontal permeability

# SITE IDENTIFICATION

- Lake City
  - 9 auger borings
    - 5, 10, 15 feet depths
  - Cased constant head permeability tests
    - Range: 0.0 – 0.19 in/hr
- Jacksonville
  - 44 auger borings
    - 4 – 8.4 feet depths
  - Cased & Uncased constant head permeability tests
    - Range: 0.02 – 9.5 in/hr cased
    - Range: 0.2 – 18.0 in/hr uncased

# LAKE CITY


N
US-90/SR-10
33
34
Proposed Stormwater
Pond Location
I-75/SR-93


N
B1
B4
B7
B2
B5
B8
B3
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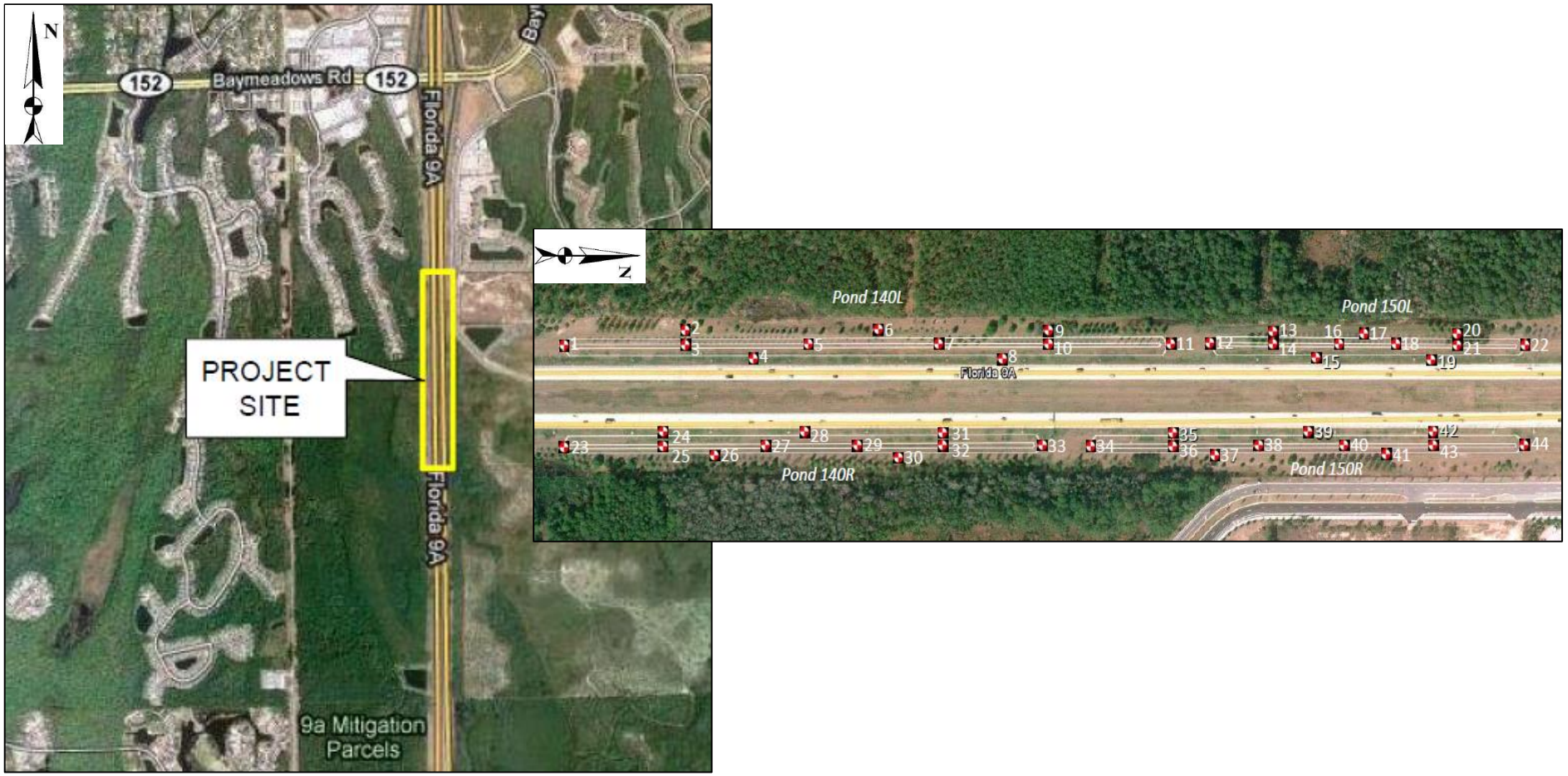
B9

# JACKSONVILLE



# VIP TESTING

- Schedule
  - August – September
- Boring locations
  - Multiple testing depths per location
  - Saturated and unsaturated
- SPT rig
  - Direct-push technique
  - Pre-drilling
    - Larger depths
    - Stiff soil

# VIP TESTING

- General testing procedure
  - Setup water tank
  - Attach probe to SPT rig
  - Advance probe to testing depth
  - Open probe
  - Saturate soil for 15 minutes
  - Begin test
  - Flush and close probe
  - Advance probe to next testing depth

# VIP TESTING

- Preliminary DOT testing
  - Tapered friction sleeve and AWJ connection adapter
    - Keep soil from building up between connections
  - Enlarged set-screw on friction sleeve
    - More resistance to torque
  - Removed internal pin
    - Locking mechanism
  - Added O-ring to inner rod
    - Internal resistance keeps outer casing in place during probe advancement

# QUESTIONS?