Pile Dynamics, Inc.
SQUID SYSTEM

Shaft Quantitative Inspection Device
for Drilled Shaft and Bored Hole Inspections

Patent pending

What are some of the methods for inspecting the cleanliness of the bottom of the drilled shaft after the clean out bucket is used?

- Cameras
- Mini-SID
- SID
- “Joe the Construction Worker”

Inspection Device Examples

- Time consuming
- Deployment is difficult
- Potentially dangerous near open hole
- Still lots of uncertainty

“Joe the Construction Worker”

- OSHA CERTIFICATE FOR CONFINED SPACES
- COSTLY
- DANGEROUS
- UNECESSARY
- RELIABLE???

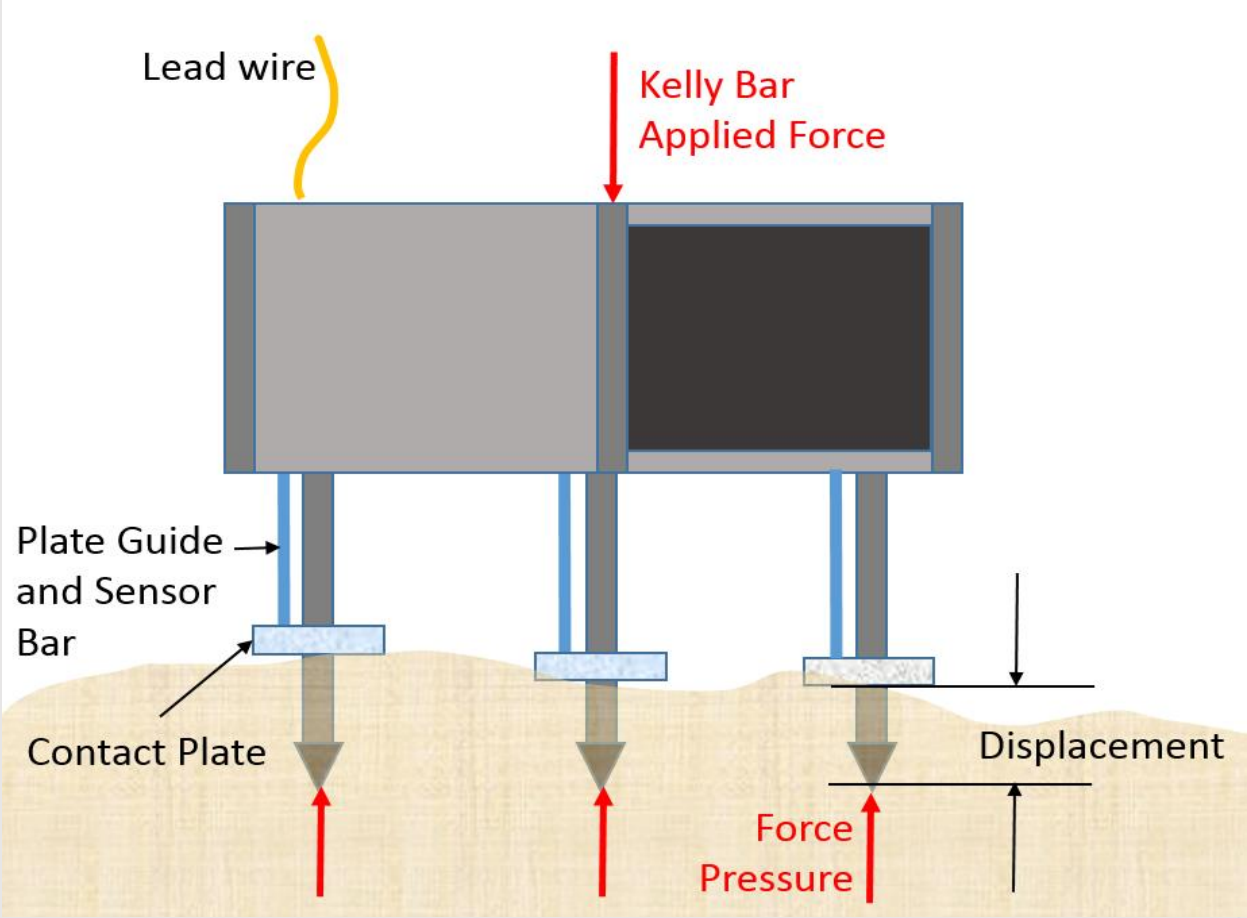
What Does SQUID Do?

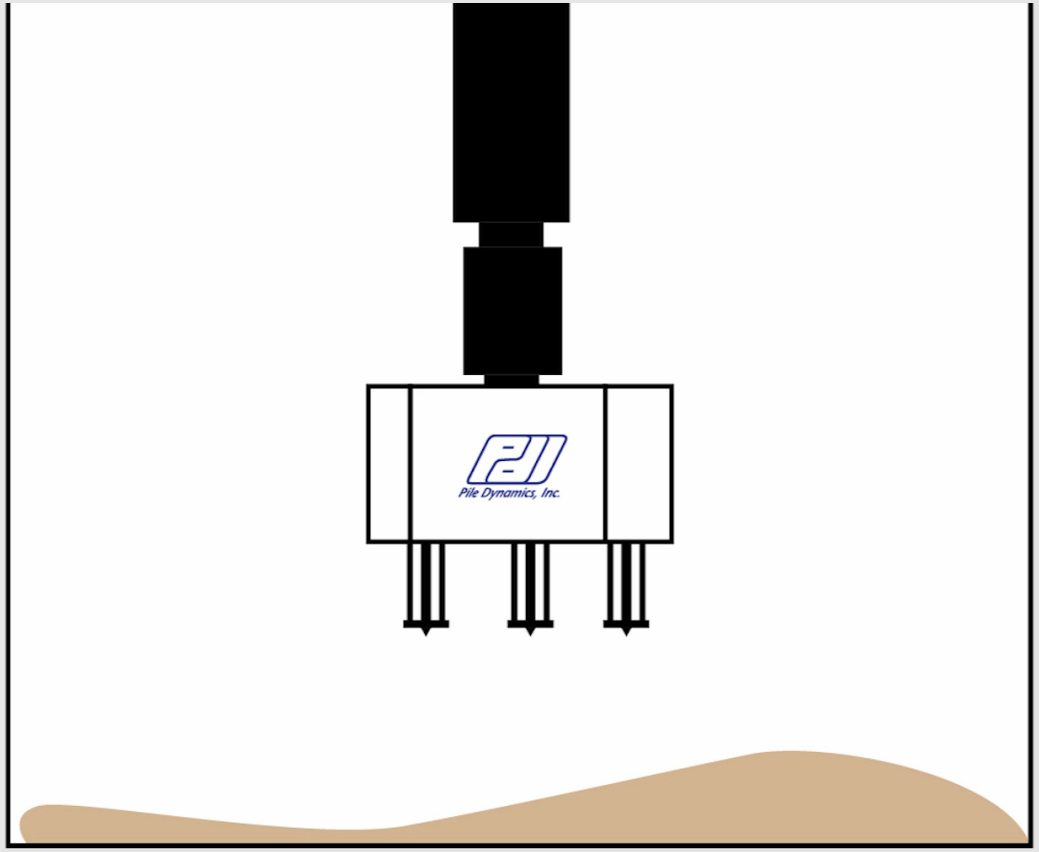
SQUID Measures:

- Thickness of debris layer by displacement (max. 6”)
- Cone Tip Pressure on the bearing layer
- Three cone penetrometers with separate depth measurements

- Standard 60º - 10 cm^2 cones
  (max. pressure 14 psi/2000 ksf each cone)

Patent pending


Lead wire
Kelly Bar
Applied Force
Plate Guide
and Sensor
Bar
Contact Plate
Displacement
Force
Pressure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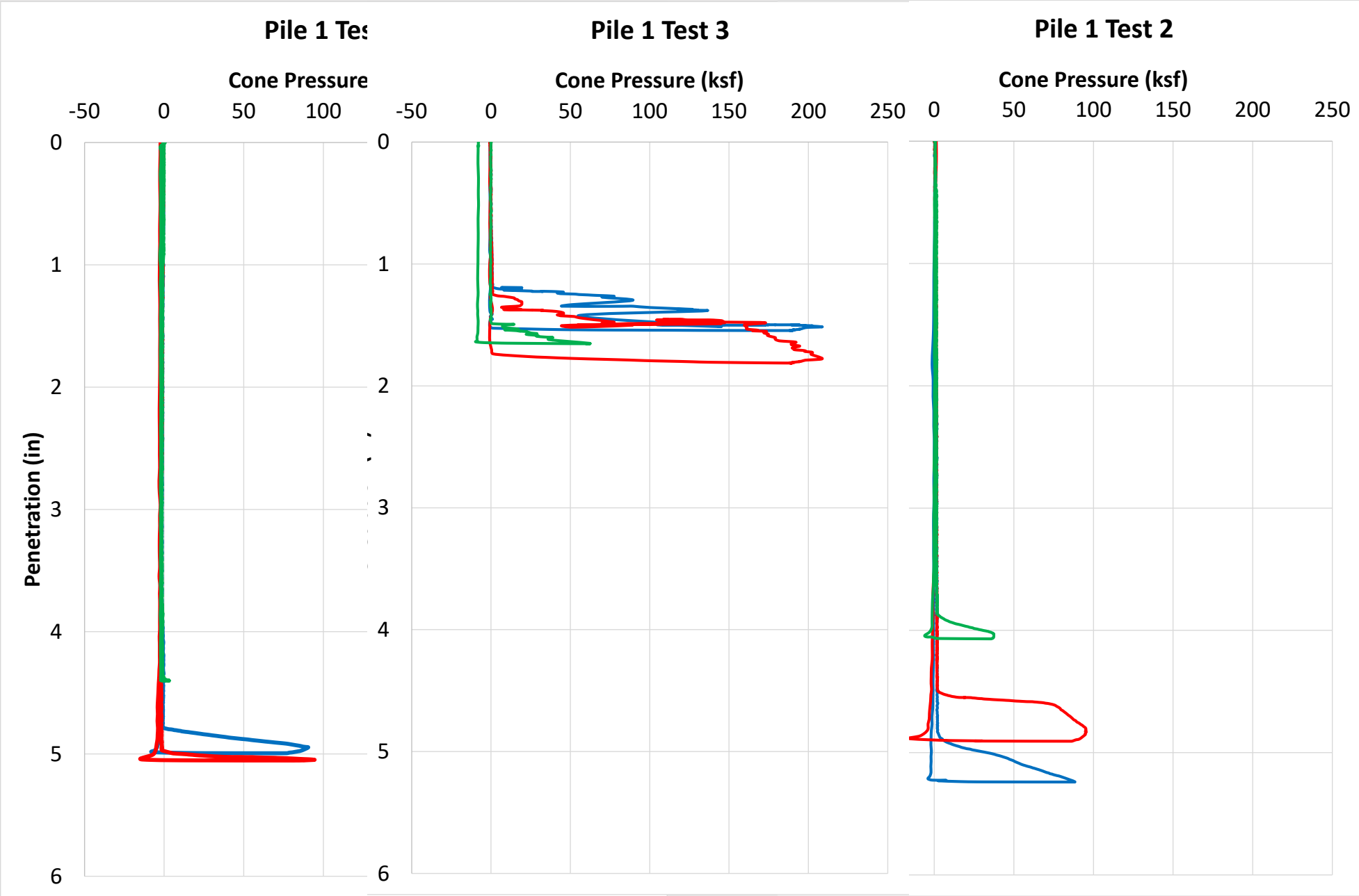
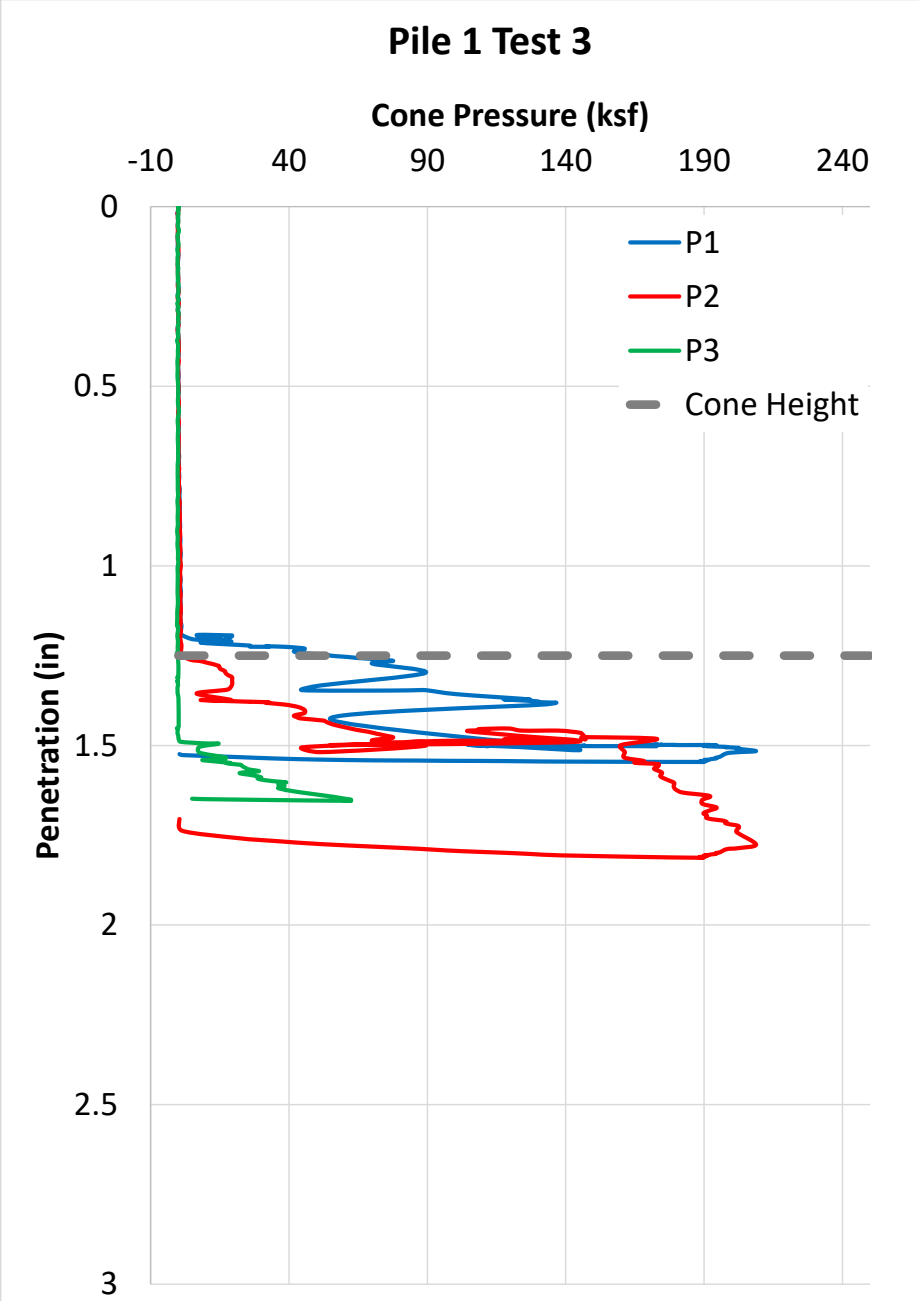
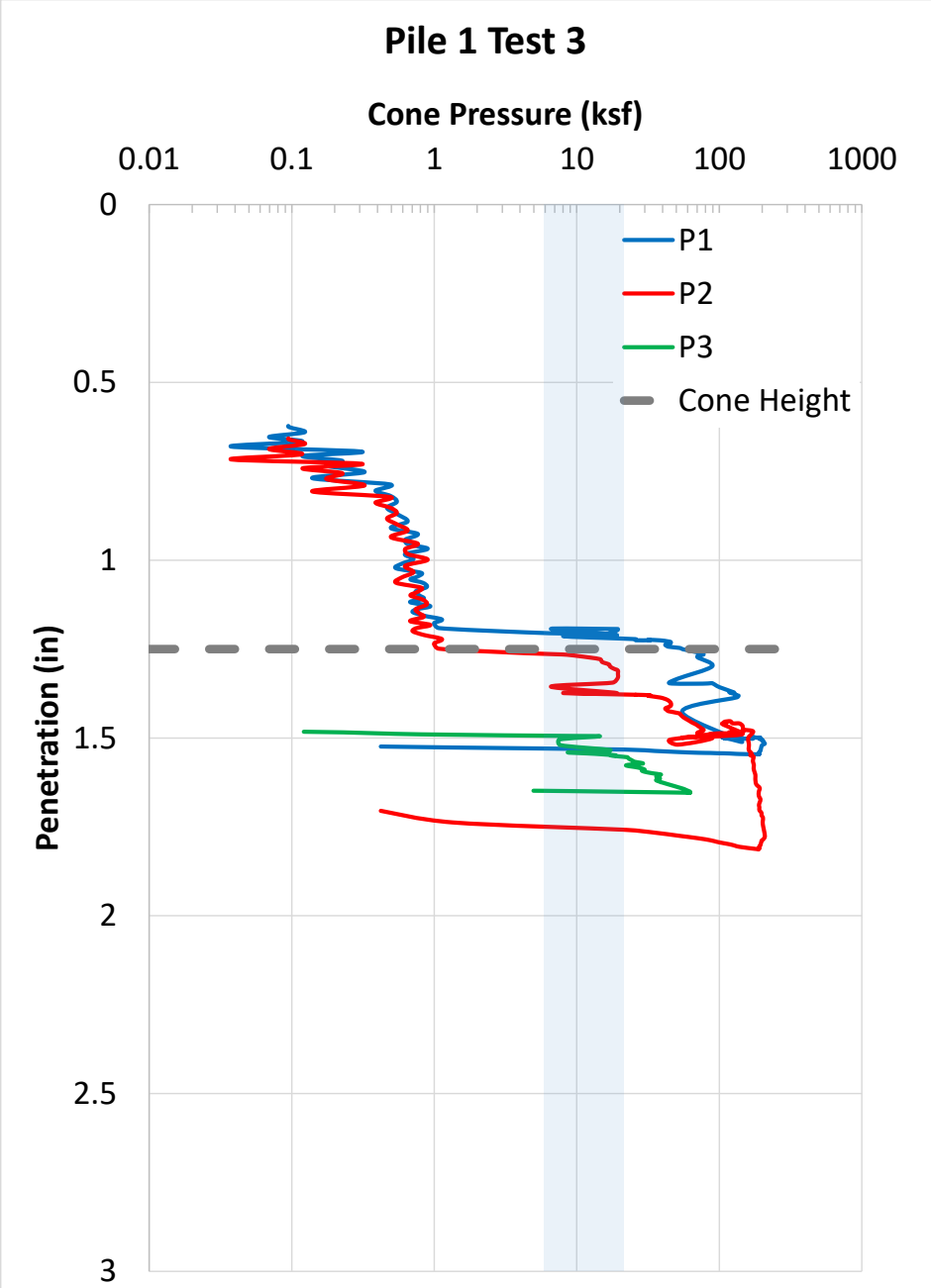
- Quickly attaches to Kelly Bar
  4”, 6” and 8” adapters
- Quick deployment accelerates inspection and minimizes debris settling from slurry
- Output is cone tip resistance as a function of penetration

Patent pending


Pile 1 Tes
Cone Pressure
-50
0
50
100
Penetration (in)
0
1
2
3
4
5
6
Pile 1 Test 3
Cone Pressure (ksf)
-50
0
50
100
150
200
250
Pile 1 Test 2
Cone Pressure (ksf)
0
50
100
150
200
250


Pile 1 Test 3
Cone Pressure (ksf)
-10
40
90
140
190
240
0
0.5
1
1.5
2
2.5
3
Penetration (in)
P1
P2
P3
Cone Height


Pile 1 Test 3
Cone Pressure (ksf)
0.01
0.1
1
10
100
1000
0
0.5
1
1.5
2
2.5
3
Penetration (in)
P1
P2
P3
Cone Height

Case Study: TIP & SQUID

Location: Pennsylvania

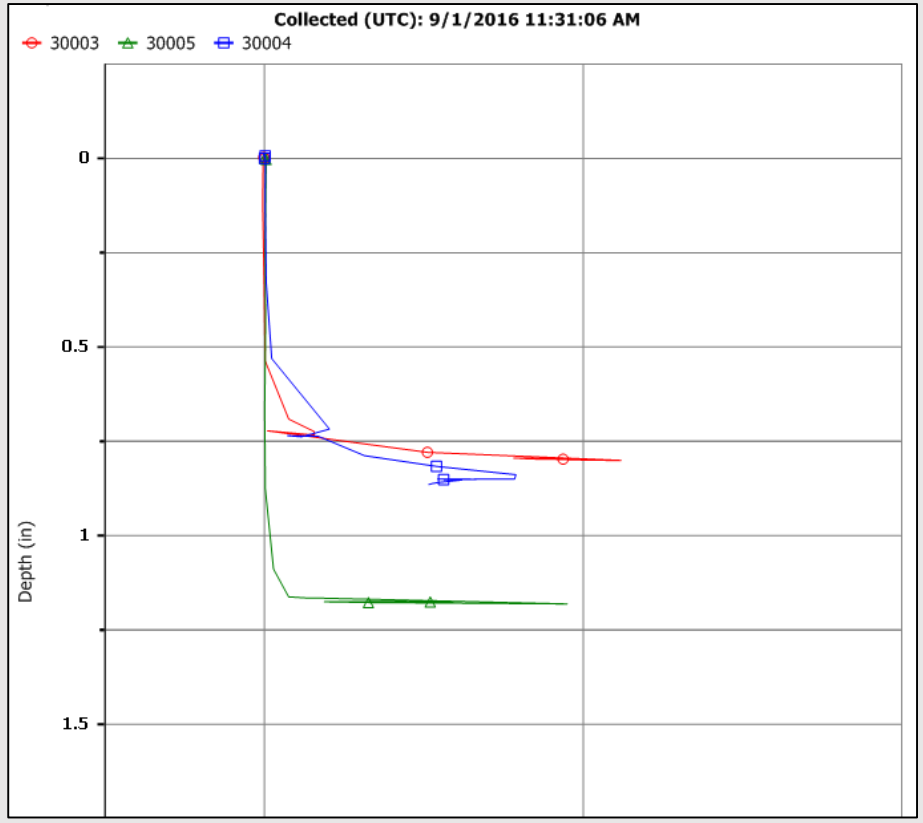
Shaft Details:

- 8 shafts tested
- 36 in. diameter
- 15-16 ft. length
- Wet construction
- Placed via tremie
- Permanently cased to rock

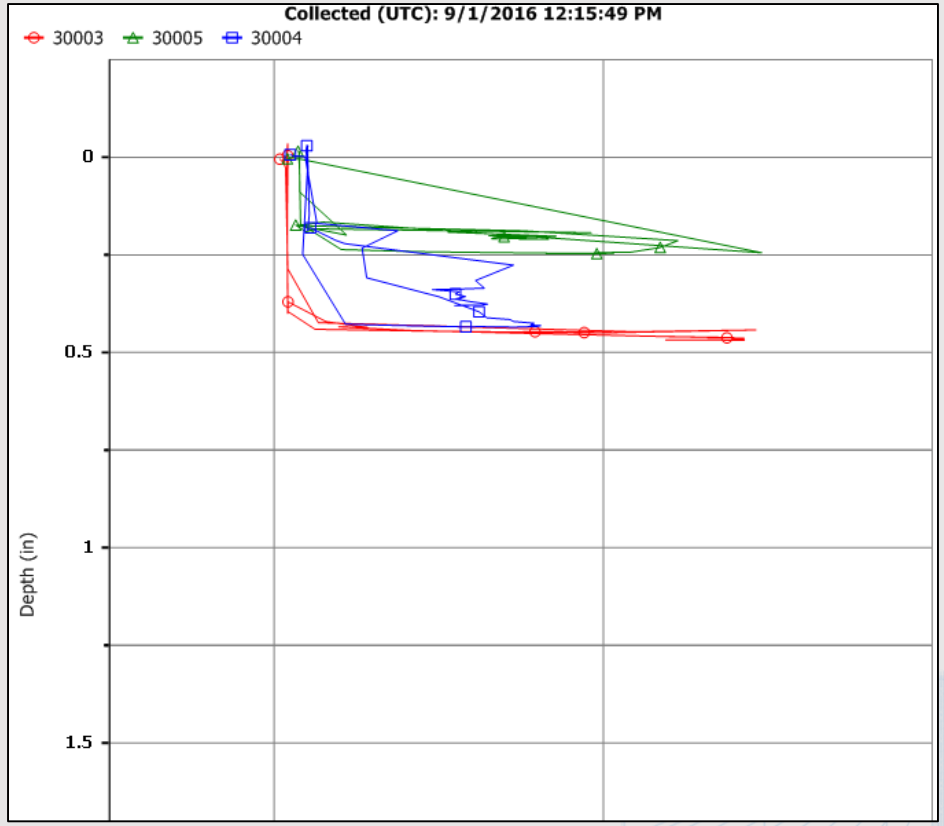
Test Type: Each shaft tested with TIP and inspected with SQUID

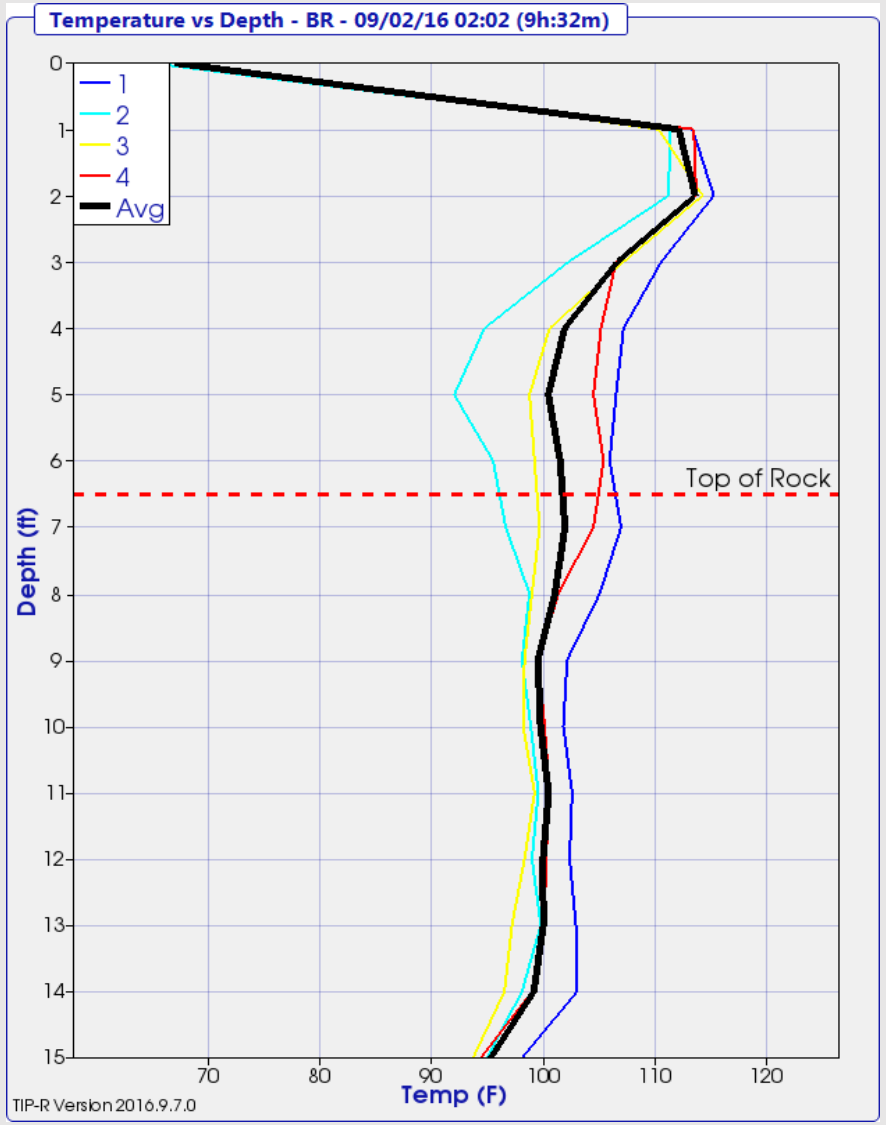
SQUID DATA – Before and After Clean out

Failed to meet spec on first 7 tests

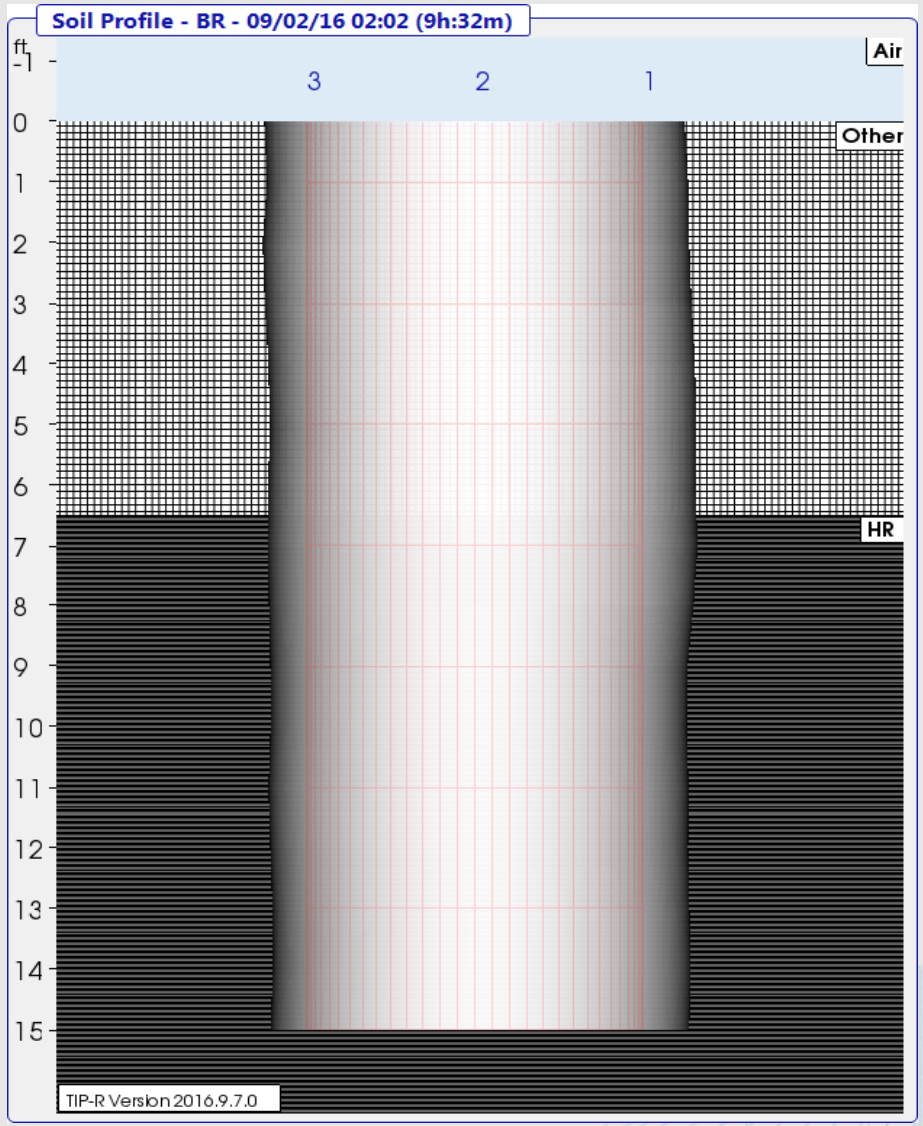


Passed on first test after clean out





Temperature vs. Depth Plot



3D Cage View

Debris Layer Thickness

- Debris is suggested to be material with insufficient bearing capacity
- SQUID tip is a circular plate, 1.37” diameter
- Terzaghi
  - $q_u = 1.3cN_c$
  - $\phi=0$, $N_c = 5.7$
  - Threshold Force = $q_u * A_{plate}$

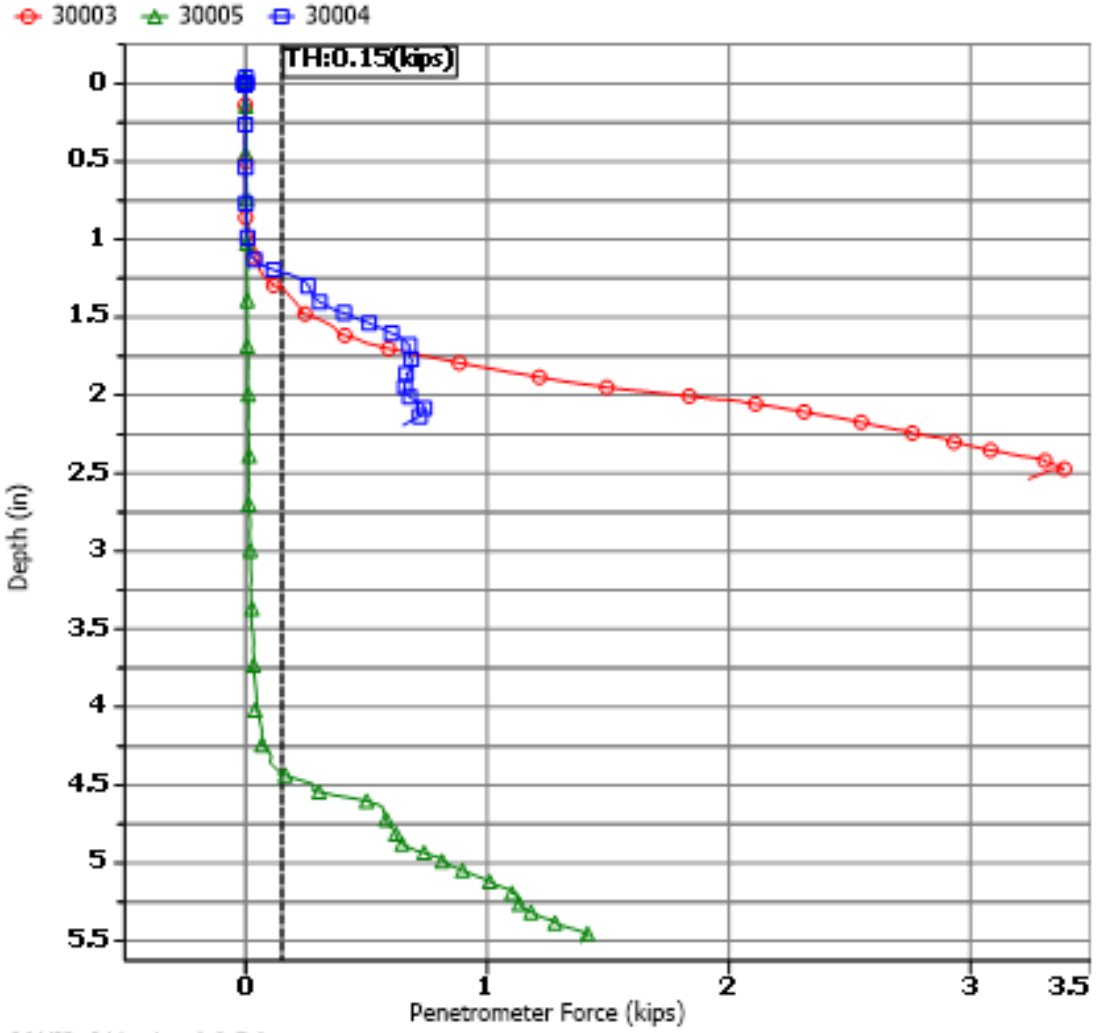
C (ksf)	q_u (ksf)	SQUID Force (kips)
0.5	3.7	0.04
1	7.4	0.08
1.5	11.1	0.12
2	14.8	0.15

SQUID-S TESTING RESULTS

Project: SALT FORK
Shaft: 1.2
Sequence number: 13
Test Table

	30003	30005	30004
Depth at 0.15 kips (in)	1.31	4.43	1.21
Maximum Penetrometer Force (kips)	3.39	1.42	0.74
Depth (in)	2.47	5.46	2.10

Collected (UTC): 12/2/2016 10:56:18 AM



SQUID-S Version 0.3.5.0

SQUID-S TESTING RESULTS

Project: SALT FORK
Shaft: 1.2
Sequence number: 4
Test Table

	30003	30005	30004
Depth at 0.15 kips (in)	0.53	0.41	0.48
Maximum Penetrometer Force (kips)	1.97	2.68	2.35
Depth (in)	0.81	0.77	0.88

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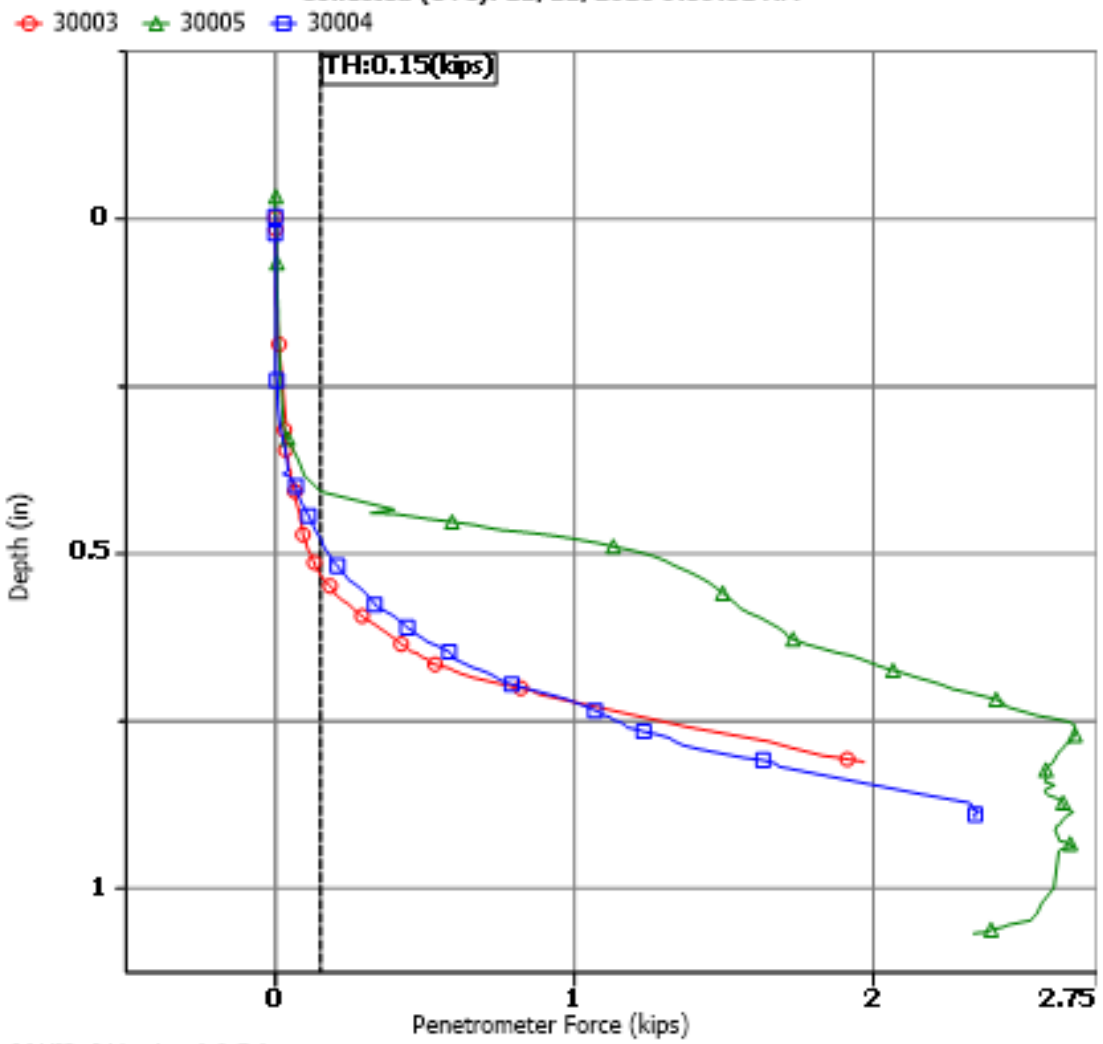

SQUID-S Version 0.3.5.0

Other Concerns

- Grooves
- Sidewalls
- Very uneven bottom conditions
- The plate will stop on anything more solid than about 3.5 Mpa (0.5 ksf) shear strength

SQUID TABLET

Size: 12.6” x 9.8” x 2.7”

Weight: 11 lbs.

Display: 10.4” Touch Screen

Video Outputs: HDMI, VGA

Battery Power: 4 Hours
(extra back-up battery pack)

Operating System: Windows 7

Data Storage: 60 GB

Data Ports: Ethernet, 4 USB

Wireless Transmitter and Main Cable

The SQUID Provides You With

- Fast Assessment of the Shaft Bottom
- Immediate Quantitative Results
- Depth of Sediment
- Determination of Bearing Layer to compare to the Geotechnical Report
- Quick and Easy Operation of the SQUID
- Allows Safe distance for personnel
- Saves Time with the Ease of Use.
- What is Time? Time is **MONEY $$**