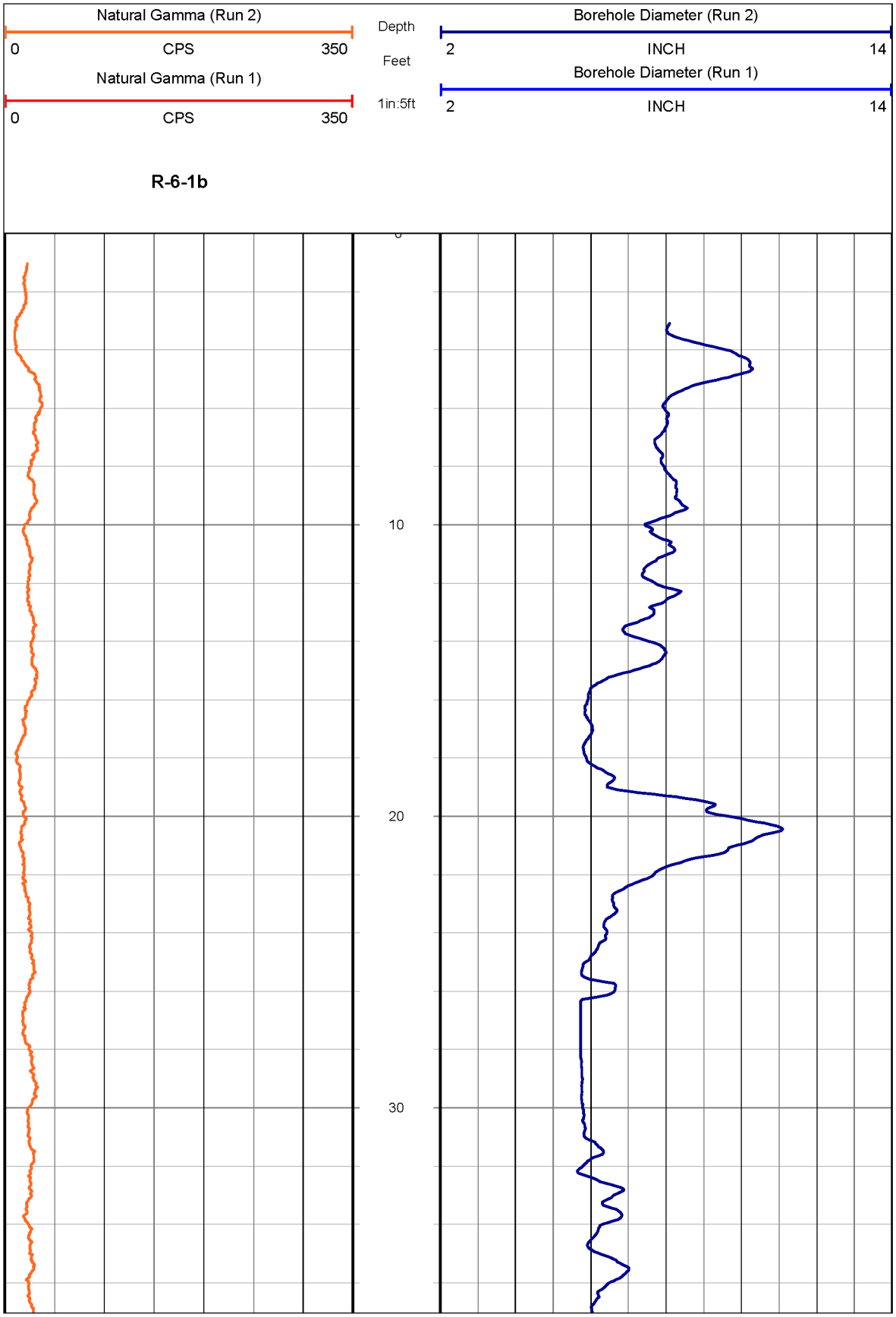
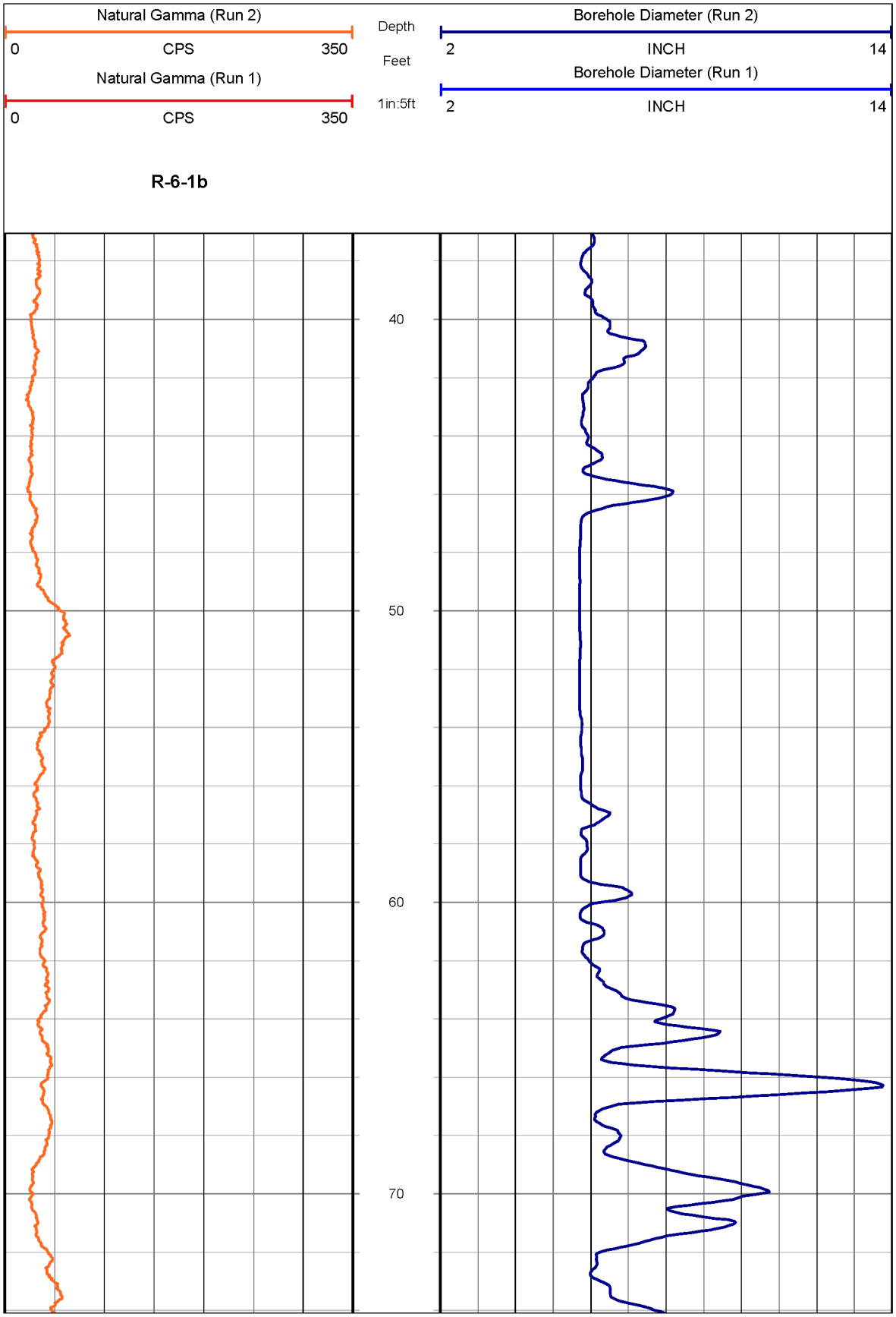
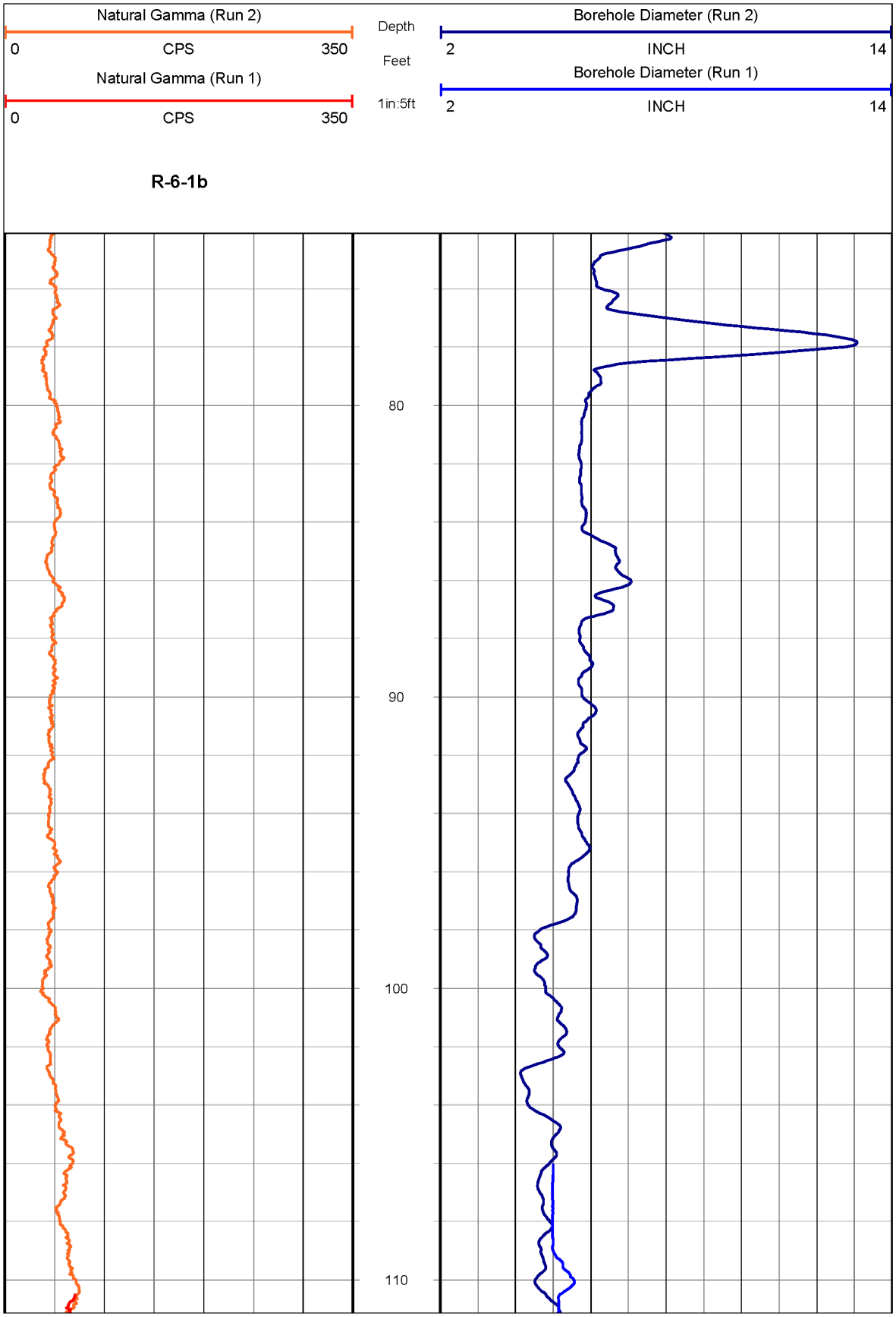
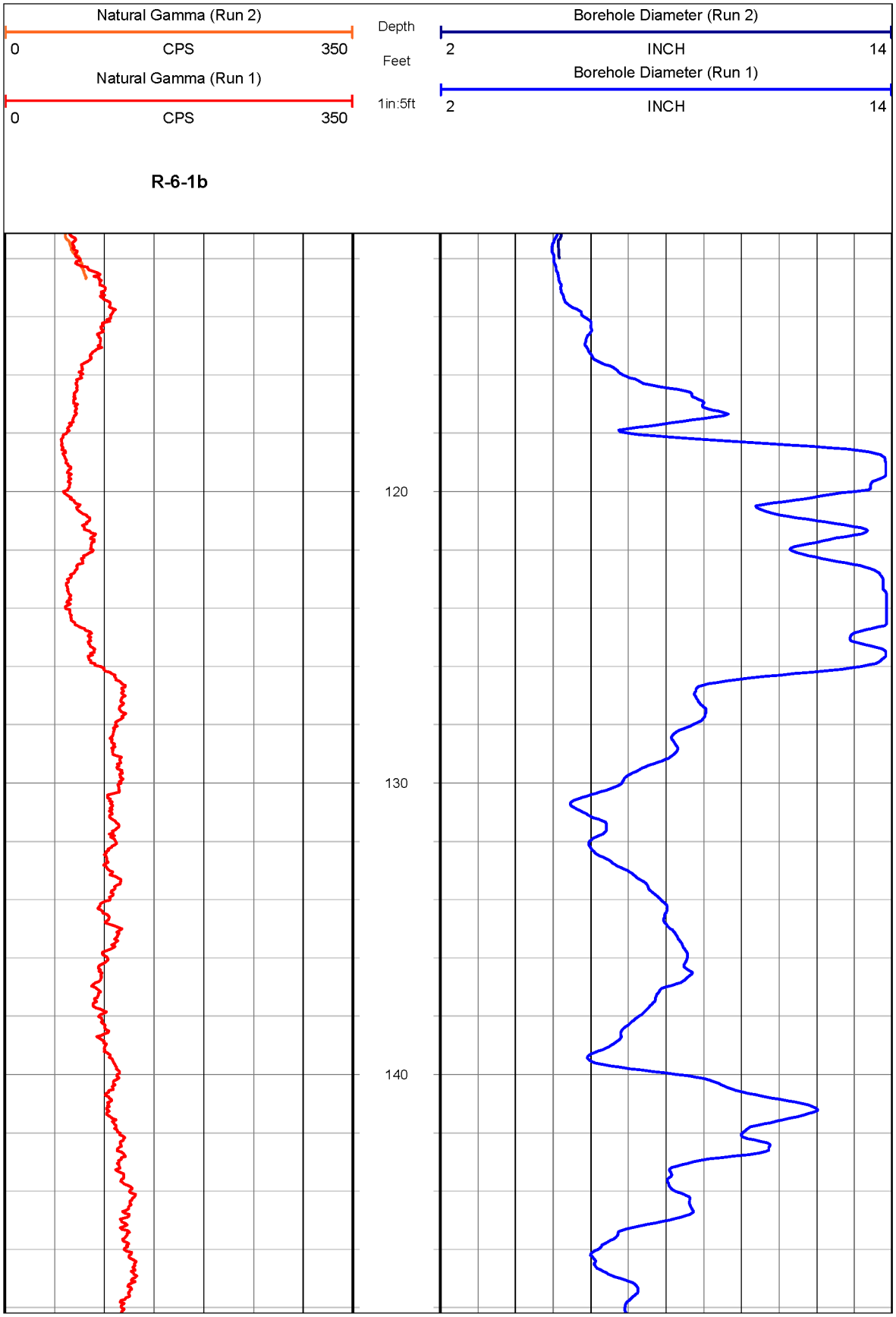
APPENDIX D

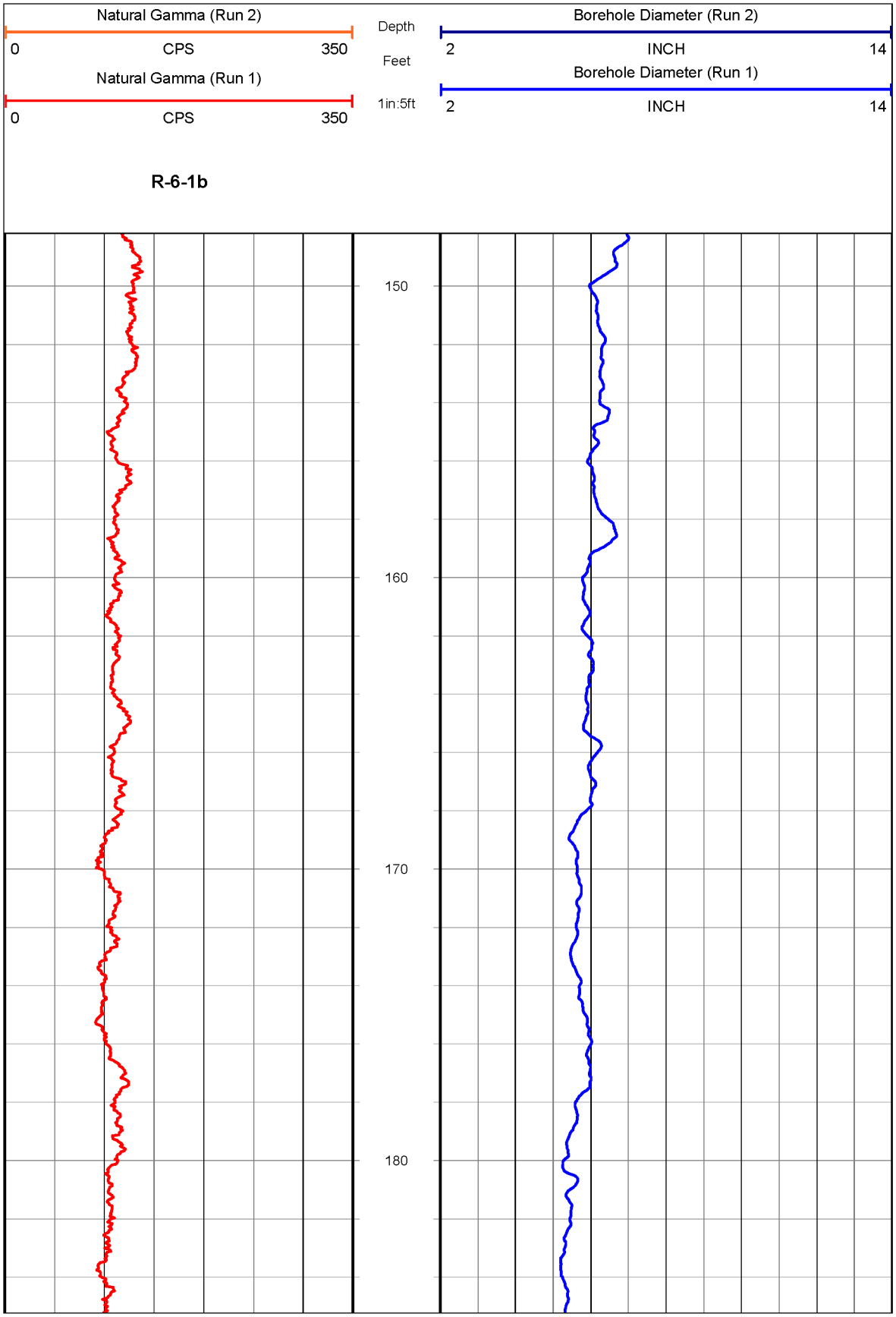
CALIPER AND NATURAL GAMMA MULTI PAGE LOG SHEETS

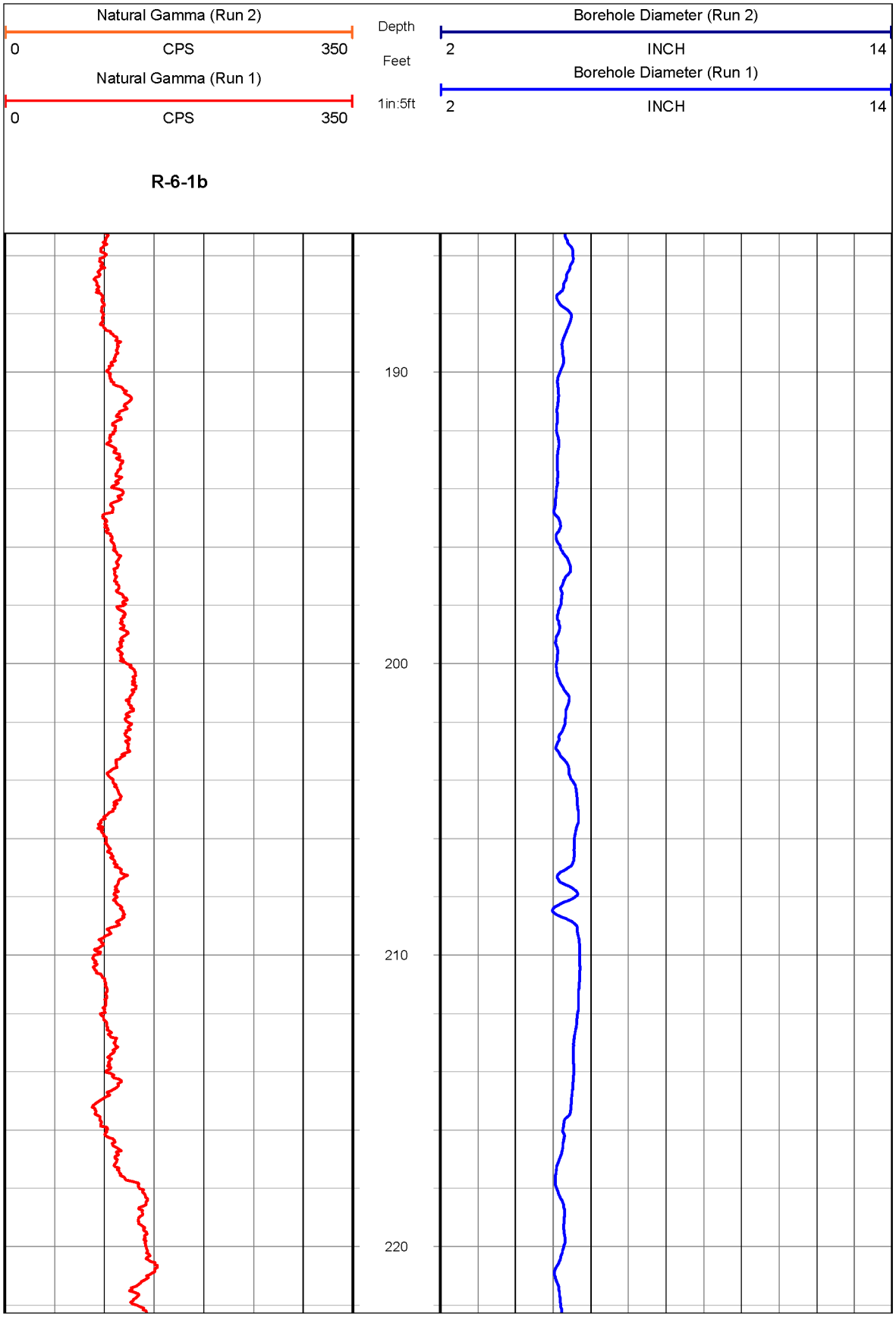

Natural Gamma (Run 2)
0
CPS
350
Natural Gamma (Run 1)
0
CPS
350
Depth
Feet
1in:5ft
Borehole Diameter (Run 2)
2
INCH
14
Borehole Diameter (Run 1)
2
INCH
14
R-6-1b
10
20
30

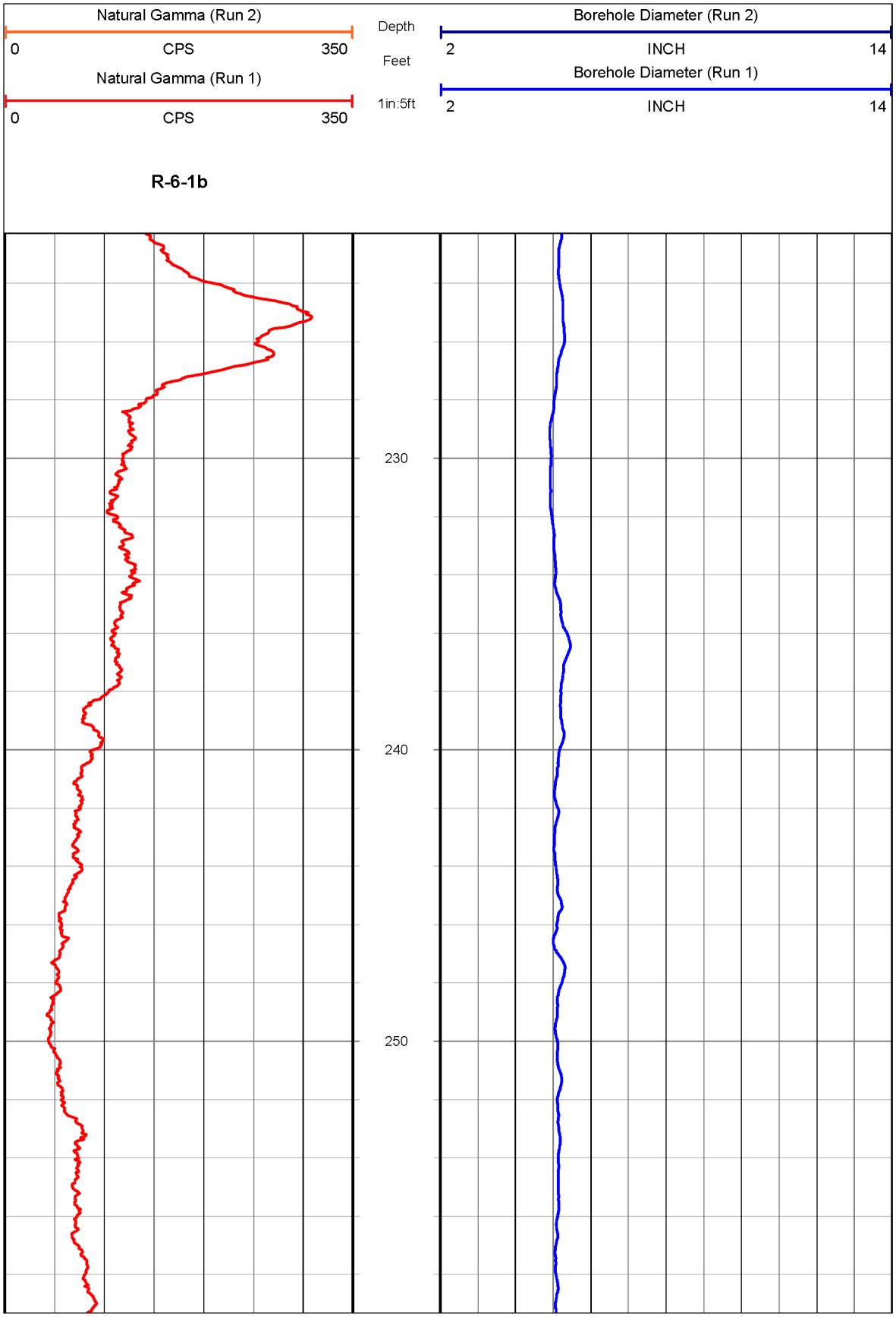

Natural Gamma (Run 2)
0
CPS
350
Natural Gamma (Run 1)
0
CPS
350
Depth
Feet
1in:5ft
Borehole Diameter (Run 2)
2
INCH
14
Borehole Diameter (Run 1)
2
INCH
14
R-6-1b
40
50
60
70

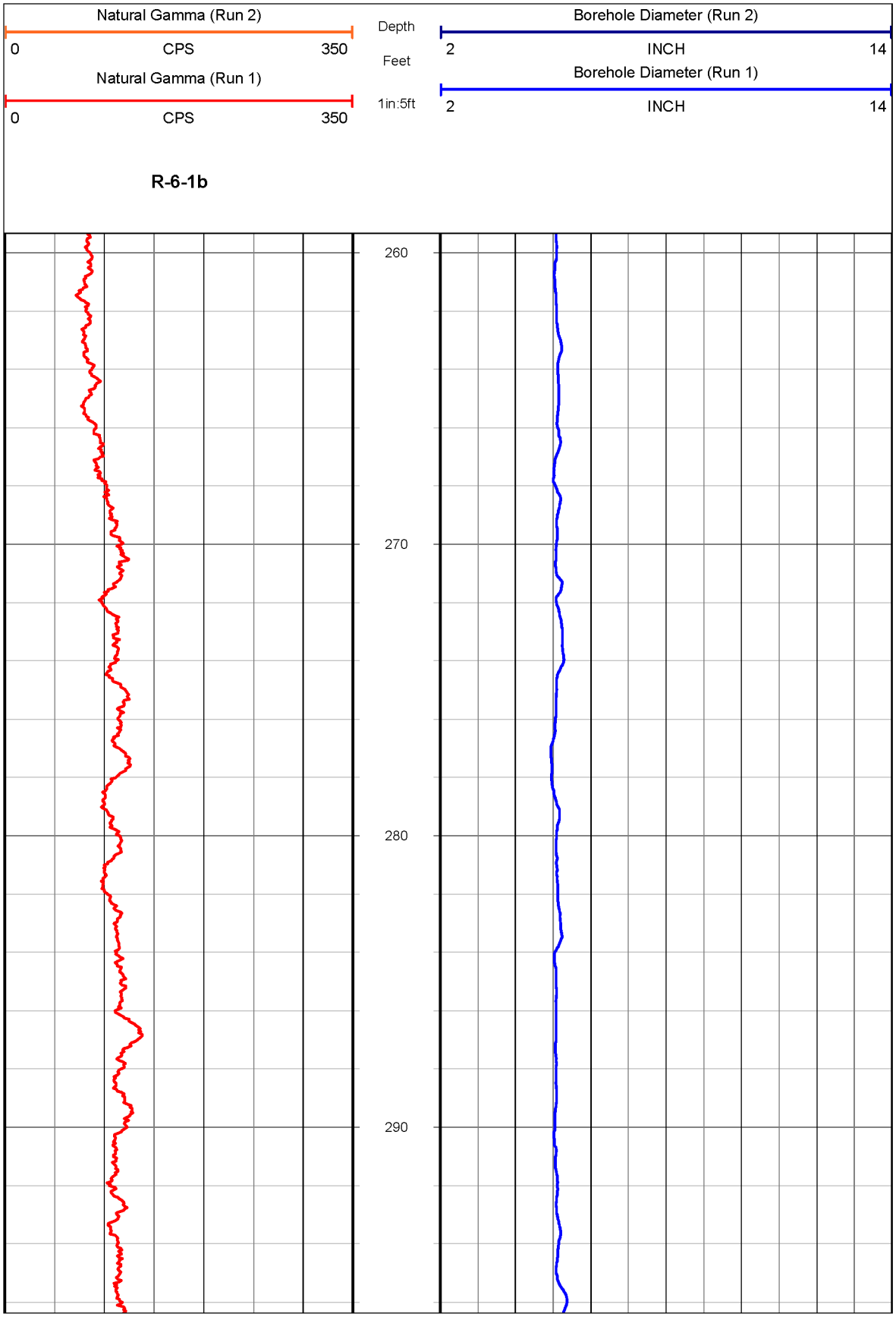

Natural Gamma (Run 2)
0
CPS
350
Natural Gamma (Run 1)
0
CPS
350
Depth
Feet
1in:5ft
Borehole Diameter (Run 2)
2
INCH
14
Borehole Diameter (Run 1)
2
INCH
14
R-6-1b
80
90
100
110

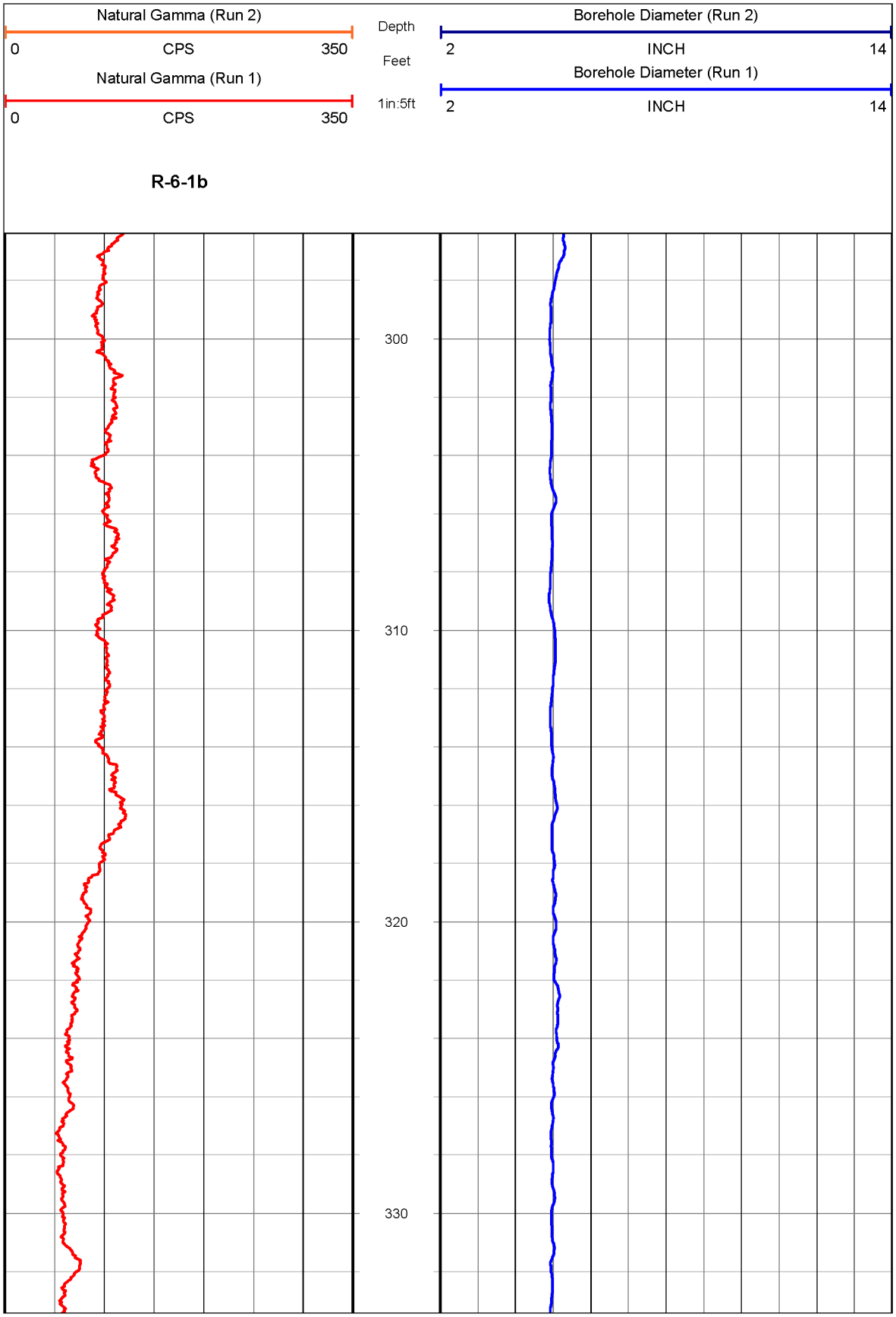

Natural Gamma (Run 2)
0
CPS
350
Natural Gamma (Run 1)
0
CPS
350
Depth
Feet
1in:5ft
Borehole Diameter (Run 2)
2
INCH
14
Borehole Diameter (Run 1)
2
INCH
14
R-6-1b
120
130
140

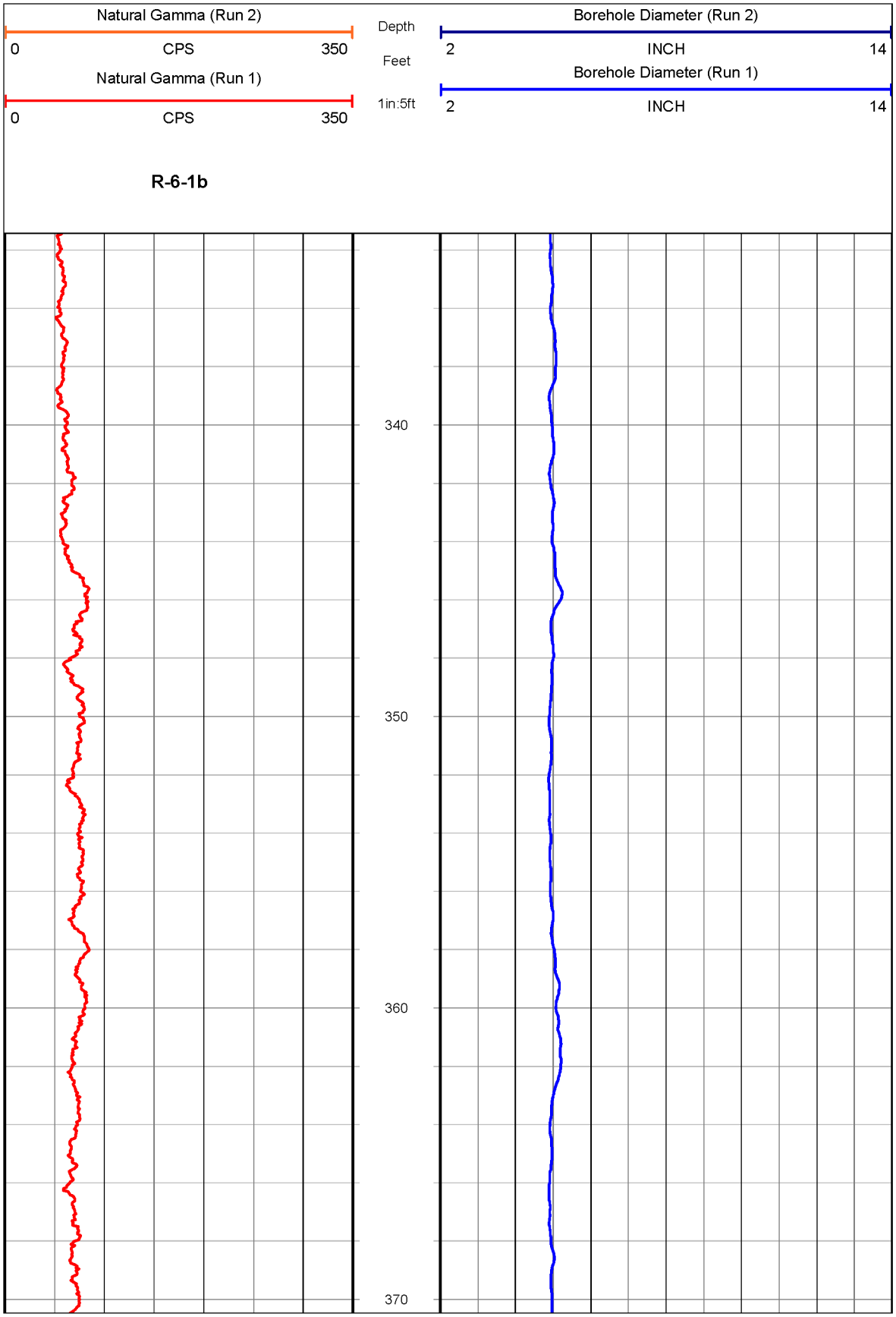

Natural Gamma (Run 2)
0
CPS
350
Natural Gamma (Run 1)
0
CPS
350
Depth
Feet
1in:5ft
Borehole Diameter (Run 2)
2
INCH
14
Borehole Diameter (Run 1)
2
INCH
14
R-6-1b
150
160
170
180

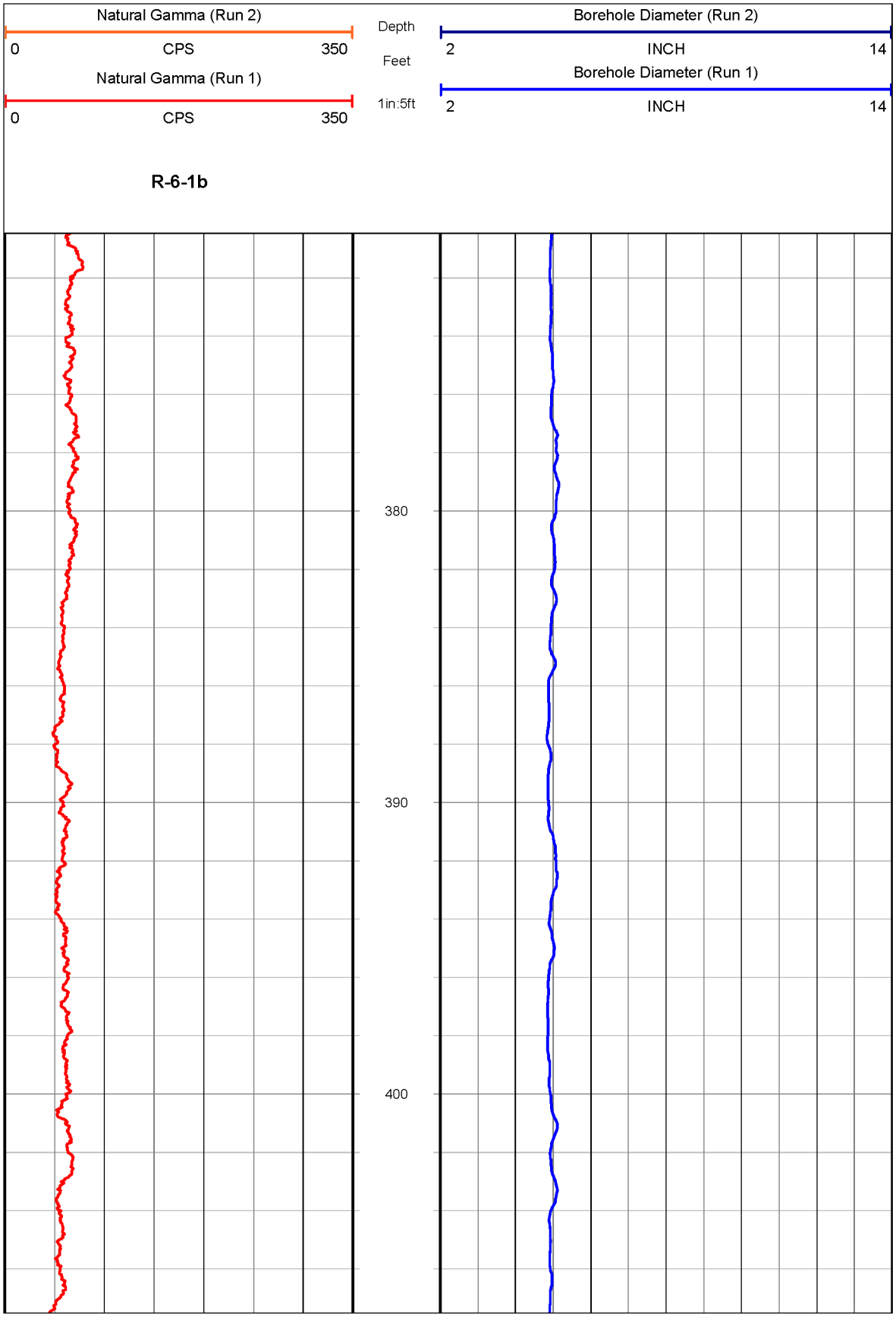

Natural Gamma (Run 2)
0
CPS
350
Natural Gamma (Run 1)
0
CPS
350
Depth
Feet
1in:5ft
Borehole Diameter (Run 2)
2
INCH
14
Borehole Diameter (Run 1)
2
INCH
14
R-6-1b
190
200
210
220

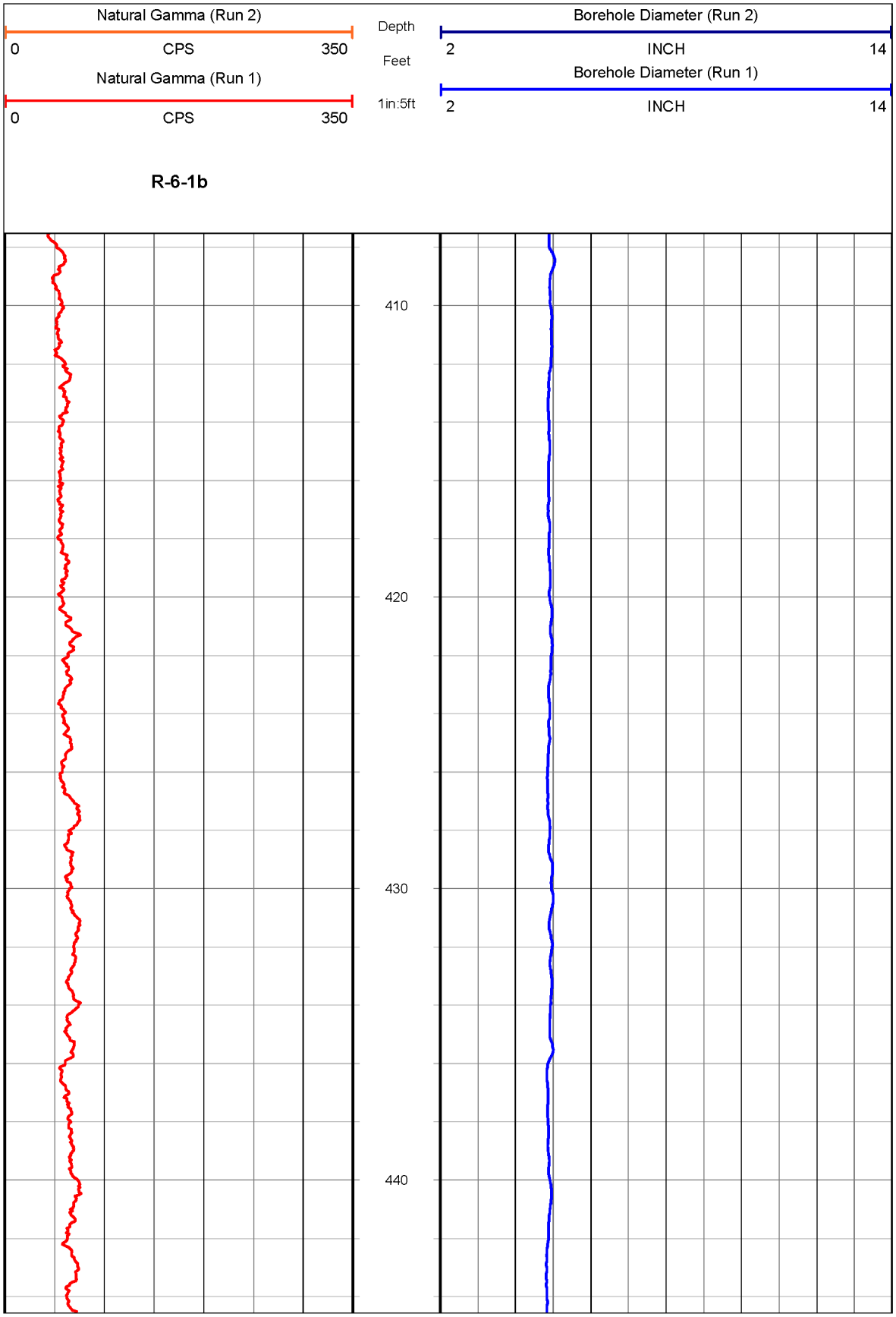

Natural Gamma (Run 2)
0
CPS
350
Natural Gamma (Run 1)
0
CPS
350
Depth
Feet
1in:5ft
Borehole Diameter (Run 2)
2
INCH
14
Borehole Diameter (Run 1)
2
INCH
14
R-6-1b
230
240
250

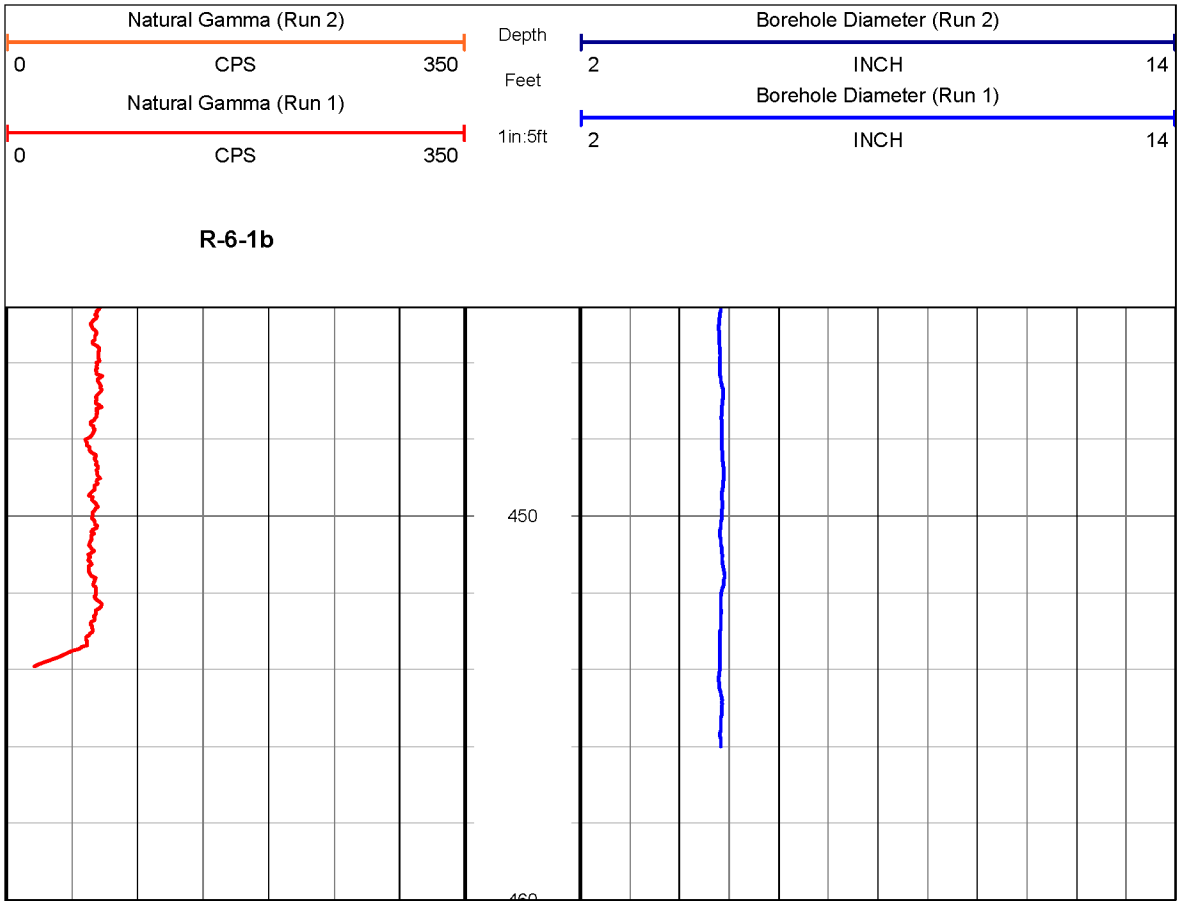

Natural Gamma (Run 2)
0
CPS
350
Natural Gamma (Run 1)
0
CPS
350
Depth
Feet
1in:5ft
Borehole Diameter (Run 2)
2
INCH
14
Borehole Diameter (Run 1)
2
INCH
14
R-6-1b
260
270
280
290

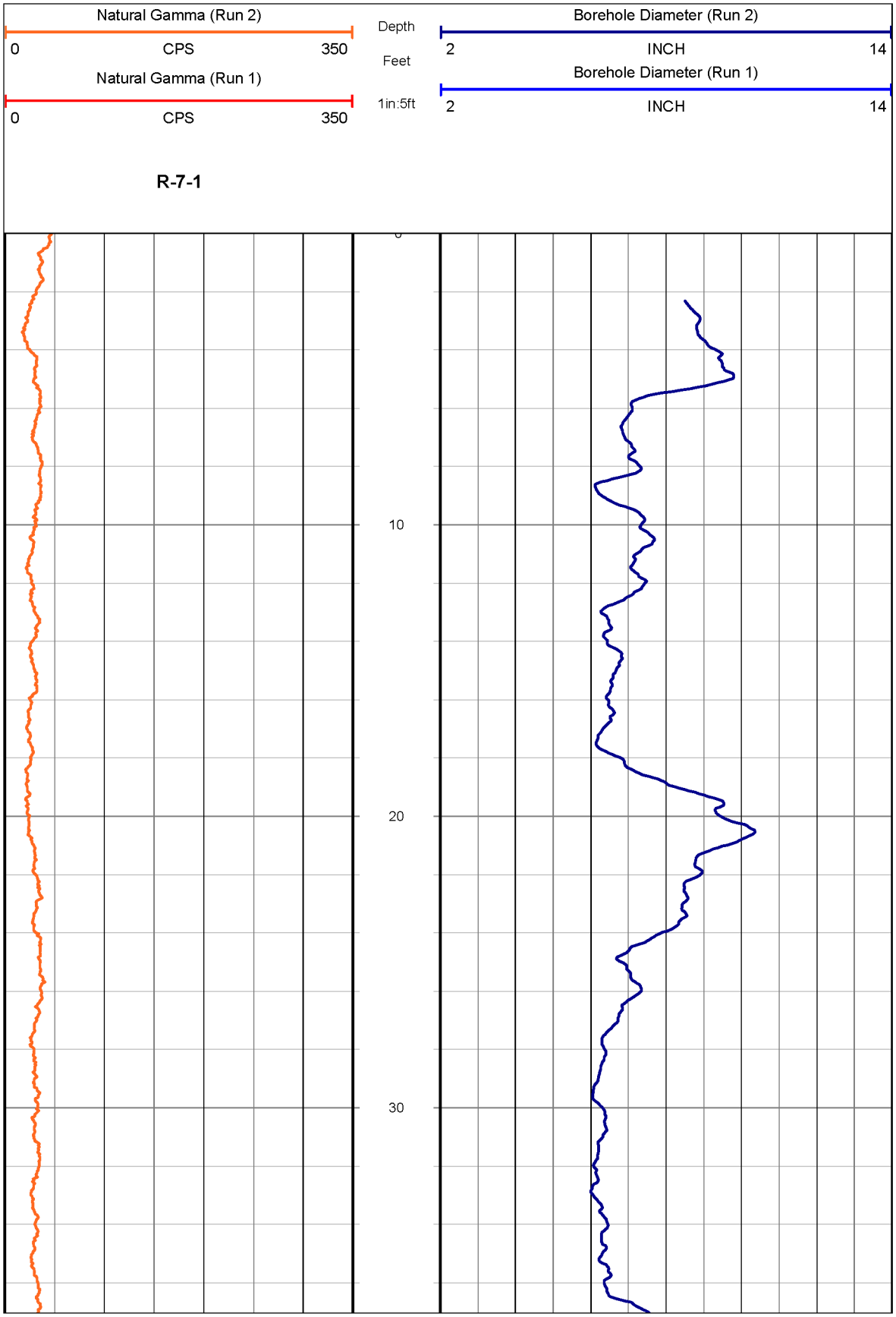

Natural Gamma (Run 2)
0
CPS
350
Natural Gamma (Run 1)
0
CPS
350
Depth
Feet
1in:5ft
Borehole Diameter (Run 2)
2
INCH
14
Borehole Diameter (Run 1)
2
INCH
14
R-6-1b
300
310
320
330

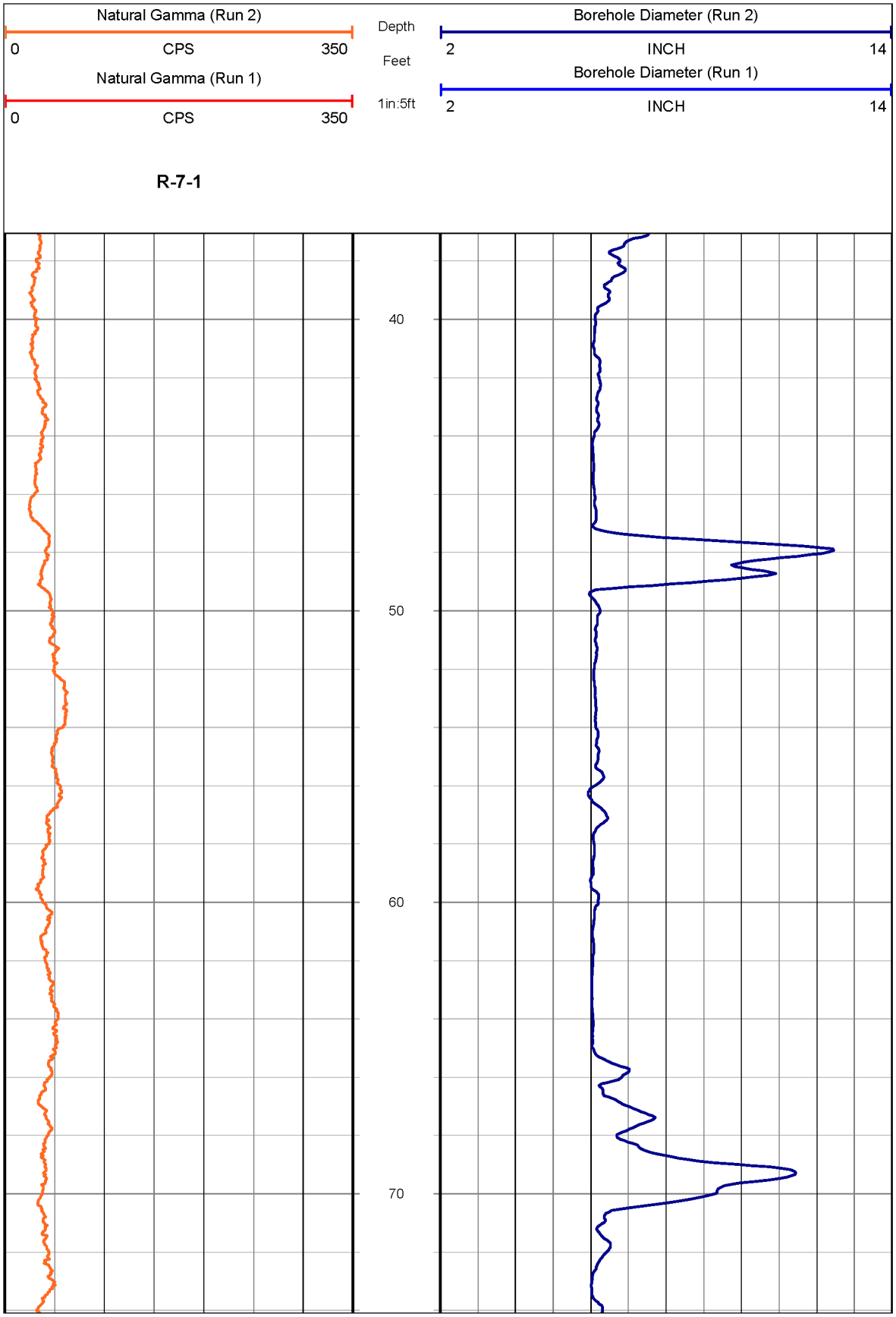

Natural Gamma (Run 2)
0
CPS
350
Natural Gamma (Run 1)
0
CPS
350
Depth
Feet
1in:5ft
Borehole Diameter (Run 2)
2
INCH
14
Borehole Diameter (Run 1)
2
INCH
14
R-6-1b
340
350
360
370

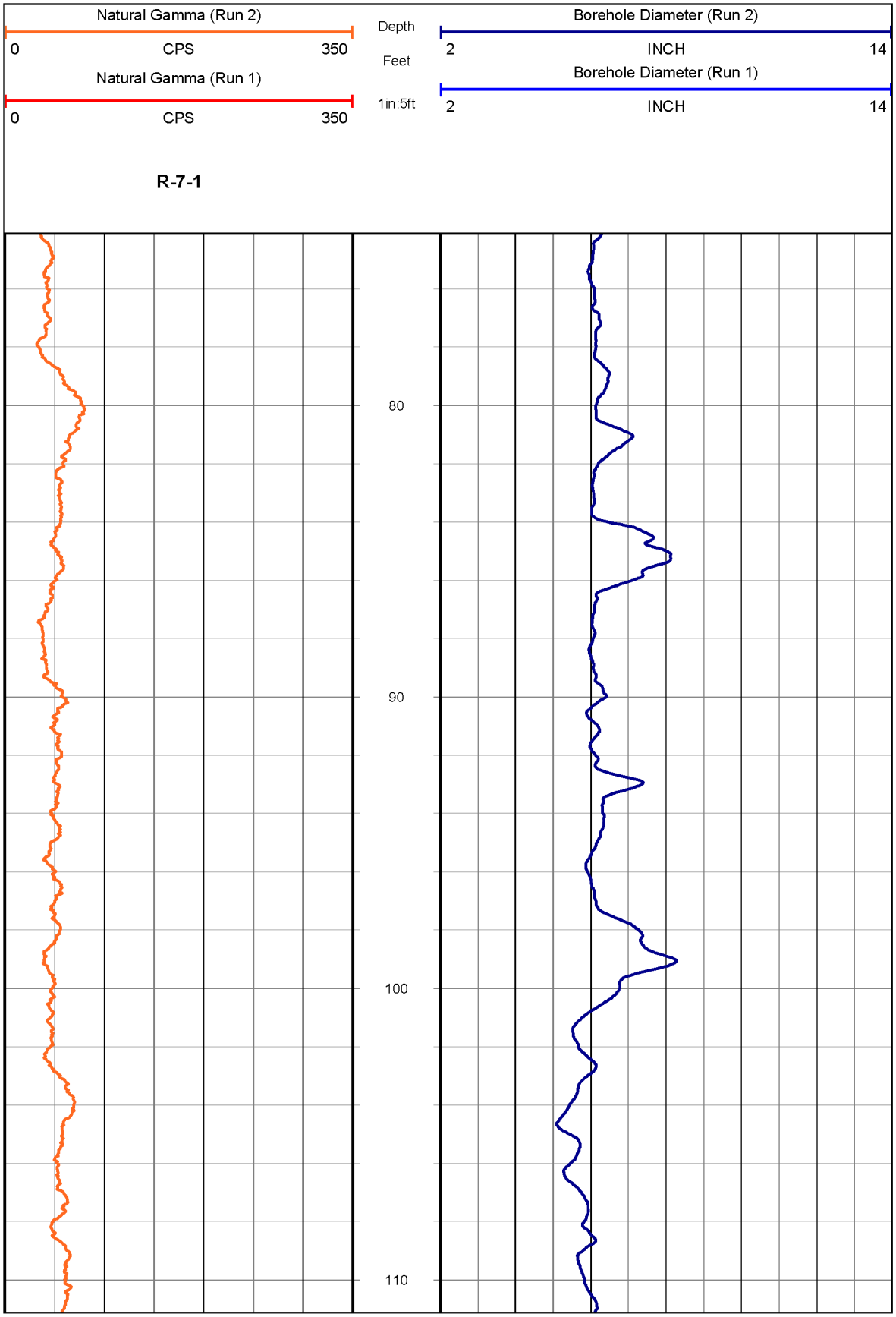

Natural Gamma (Run 2)
0
CPS
350
Natural Gamma (Run 1)
0
CPS
350
Depth
Feet
1in:5ft
Borehole Diameter (Run 2)
2
INCH
14
Borehole Diameter (Run 1)
2
INCH
14
R-6-1b
380
390
400

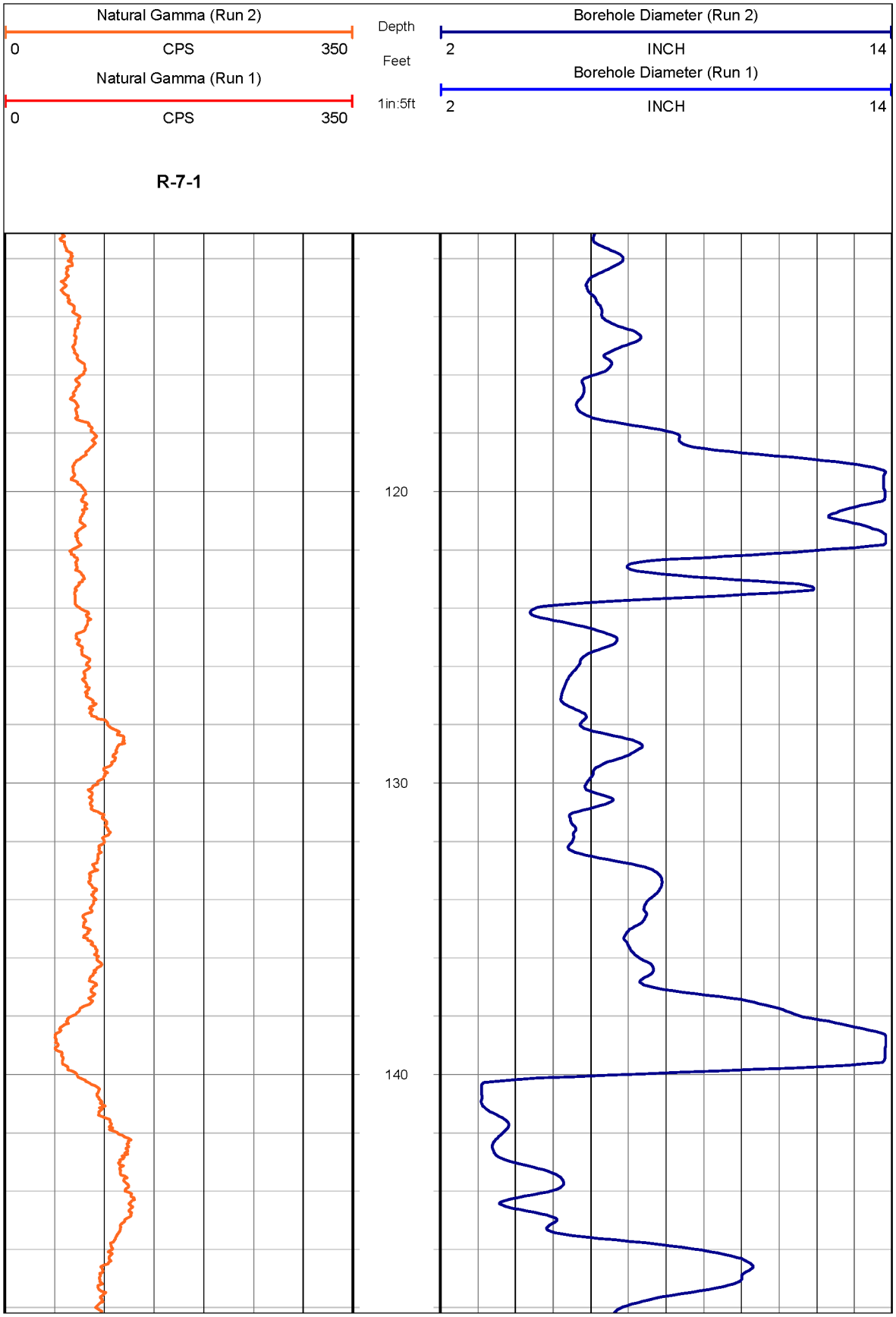

Natural Gamma (Run 2)
0
CPS
350
Natural Gamma (Run 1)
0
CPS
350
Depth
Feet
1in:5ft
Borehole Diameter (Run 2)
2
INCH
14
Borehole Diameter (Run 1)
2
INCH
14
R-6-1b
410
420
430
440

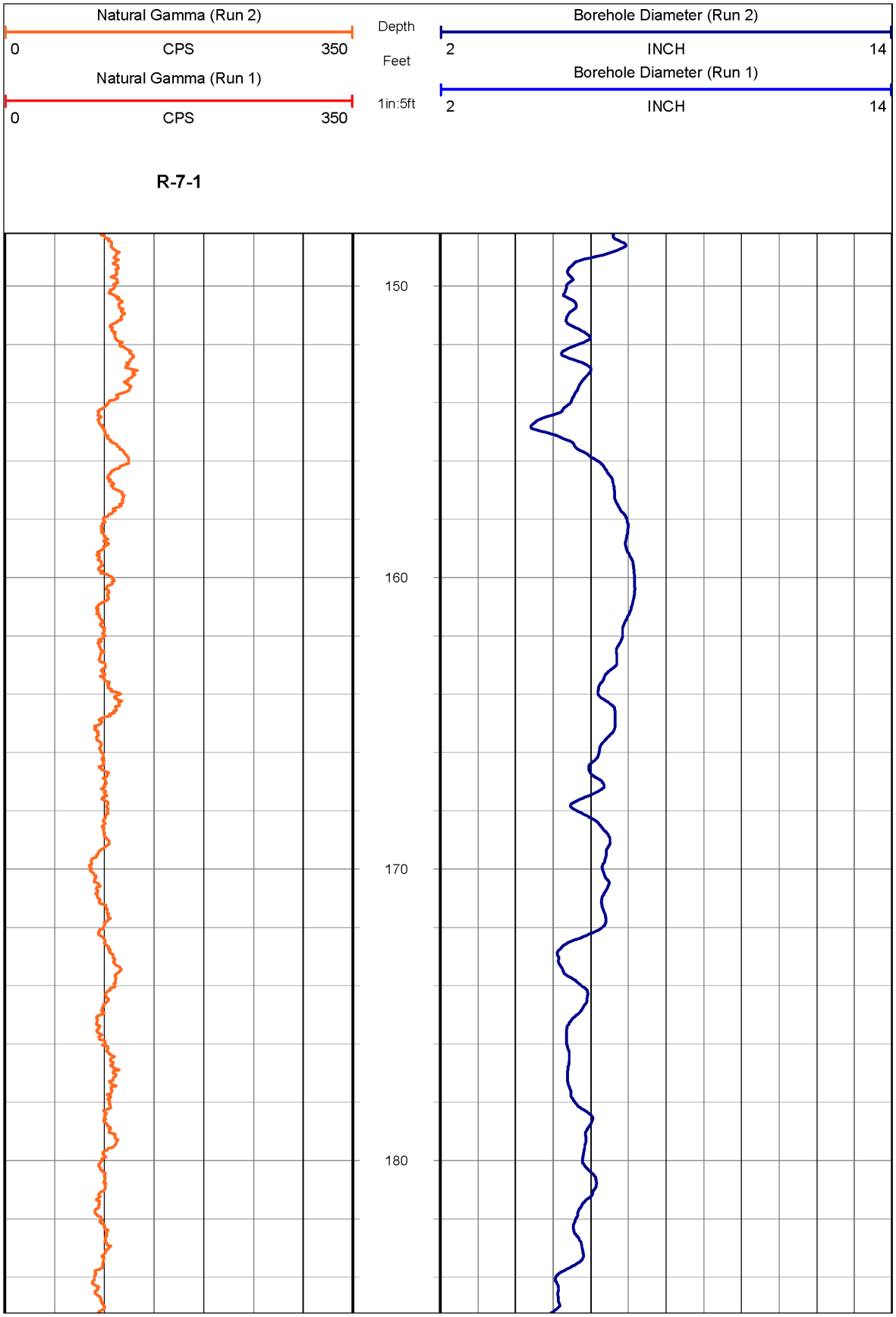

Natural Gamma (Run 2)
0
CPS
350
Natural Gamma (Run 1)
0
CPS
350
Depth
Feet
1in:5ft
Borehole Diameter (Run 2)
2
INCH
14
Borehole Diameter (Run 1)
2
INCH
14
R-6-1b
450

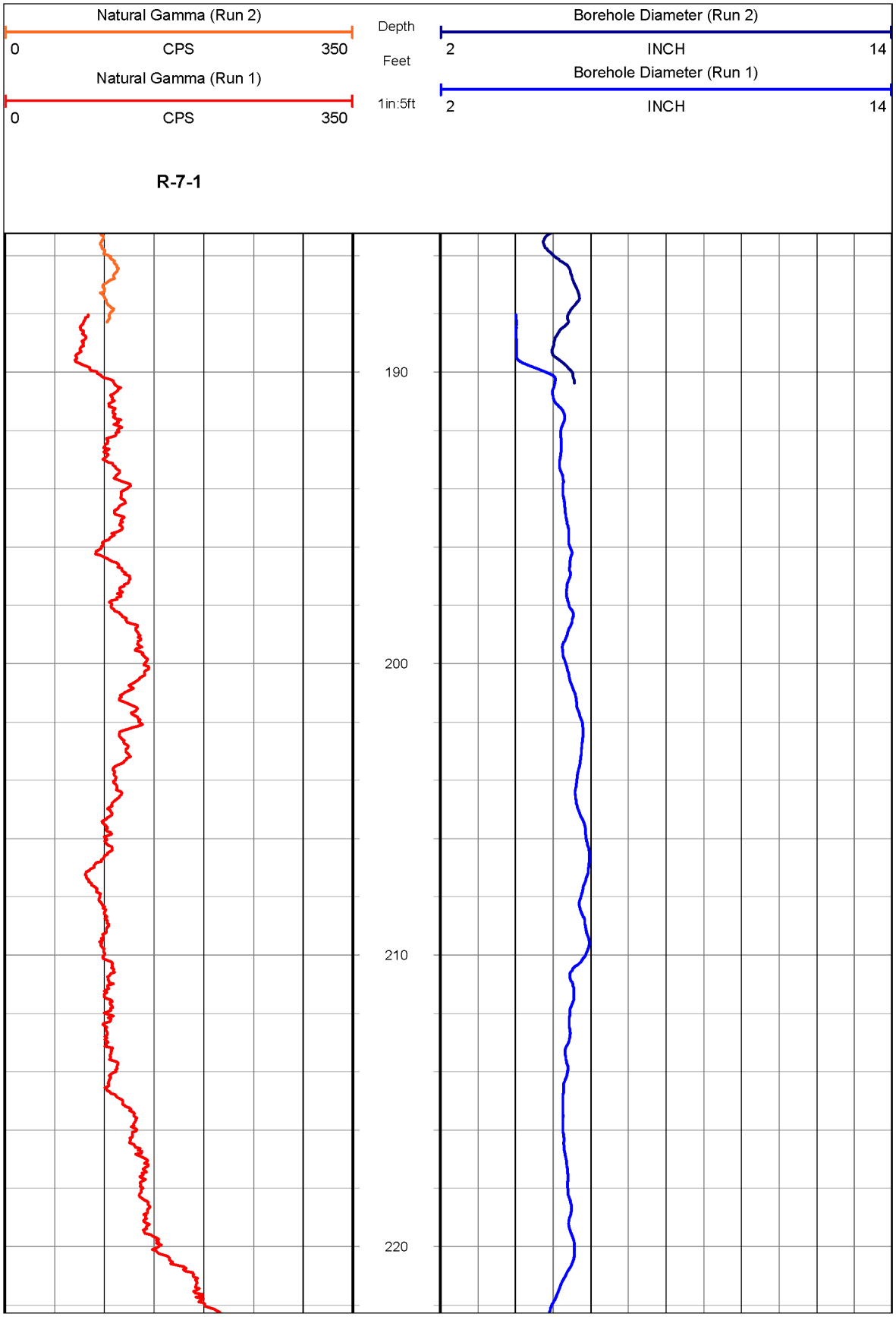

Natural Gamma (Run 2)
0
CPS
350
Natural Gamma (Run 1)
0
CPS
350
Depth
Feet
1in:5ft
Borehole Diameter (Run 2)
2
INCH
14
Borehole Diameter (Run 1)
2
INCH
14
R-7-1
10
20
30

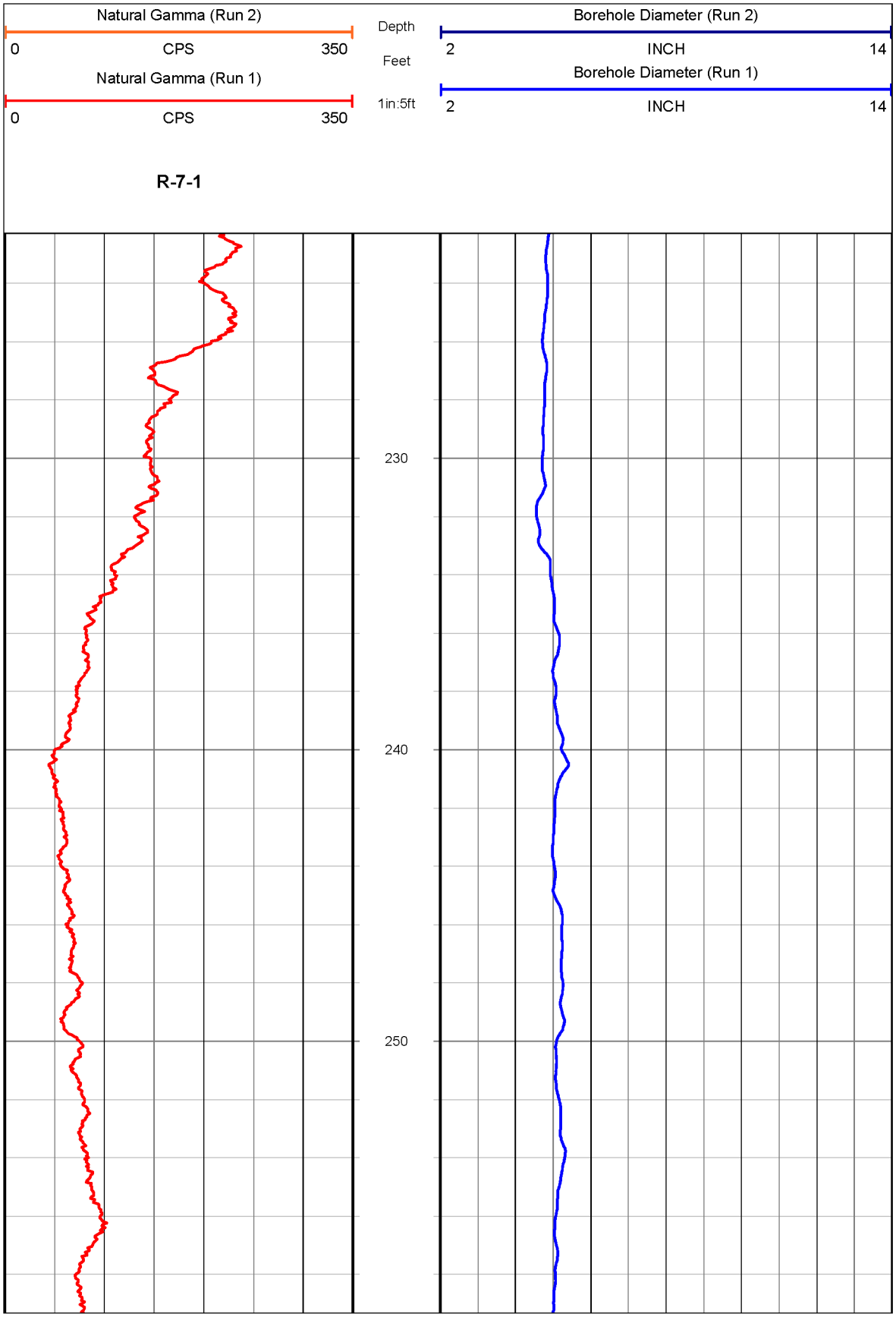

Natural Gamma (Run 2)
0
CPS
350
Natural Gamma (Run 1)
0
CPS
350
Depth
Feet
1in:5ft
Borehole Diameter (Run 2)
2
INCH
14
Borehole Diameter (Run 1)
2
INCH
14
R-7-1
40
50
60
70

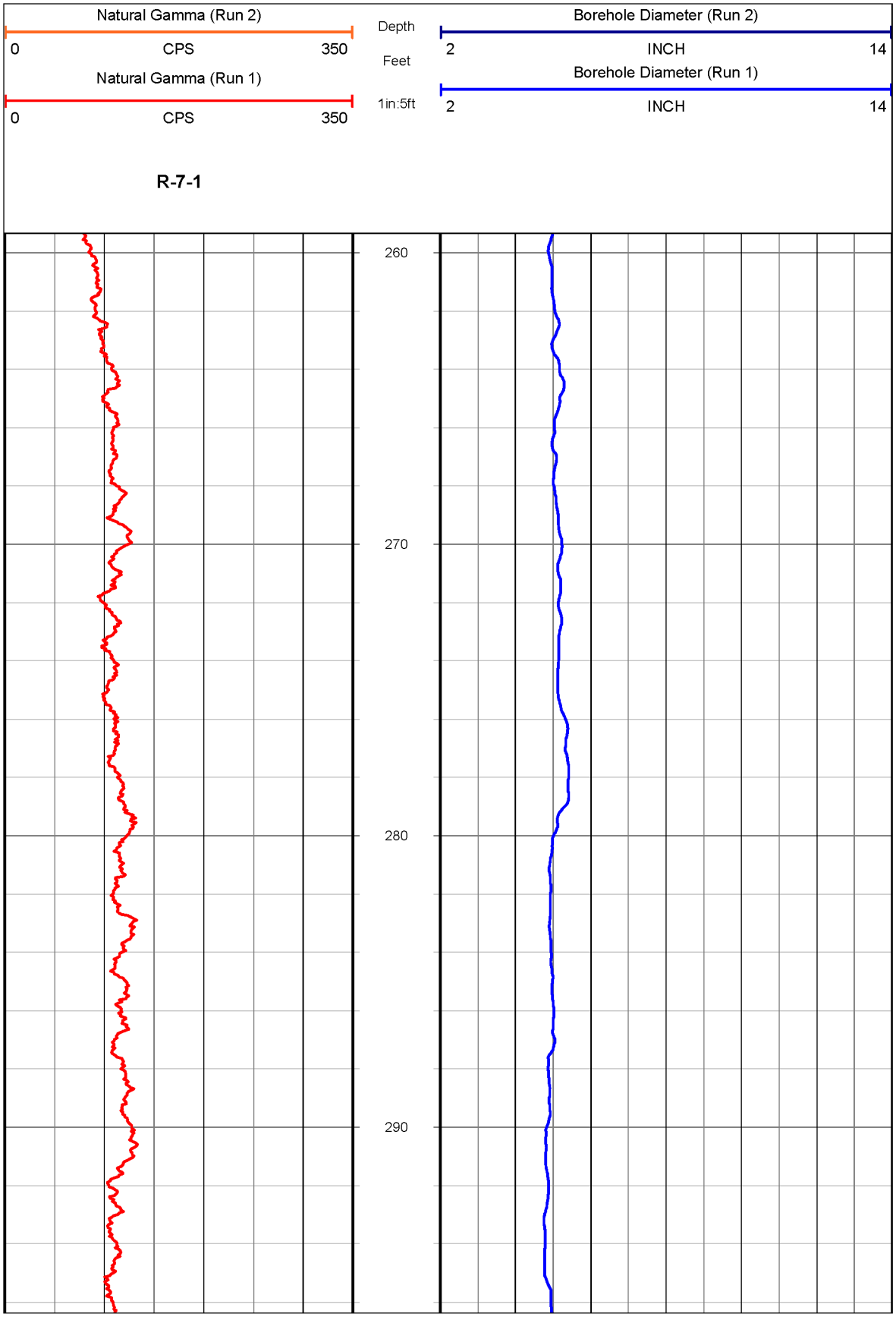

Natural Gamma (Run 2)
0
CPS
350
Natural Gamma (Run 1)
0
CPS
350
Depth
Feet
1in:5ft
Borehole Diameter (Run 2)
2
INCH
14
Borehole Diameter (Run 1)
2
INCH
14
R-7-1
80
90
100
110

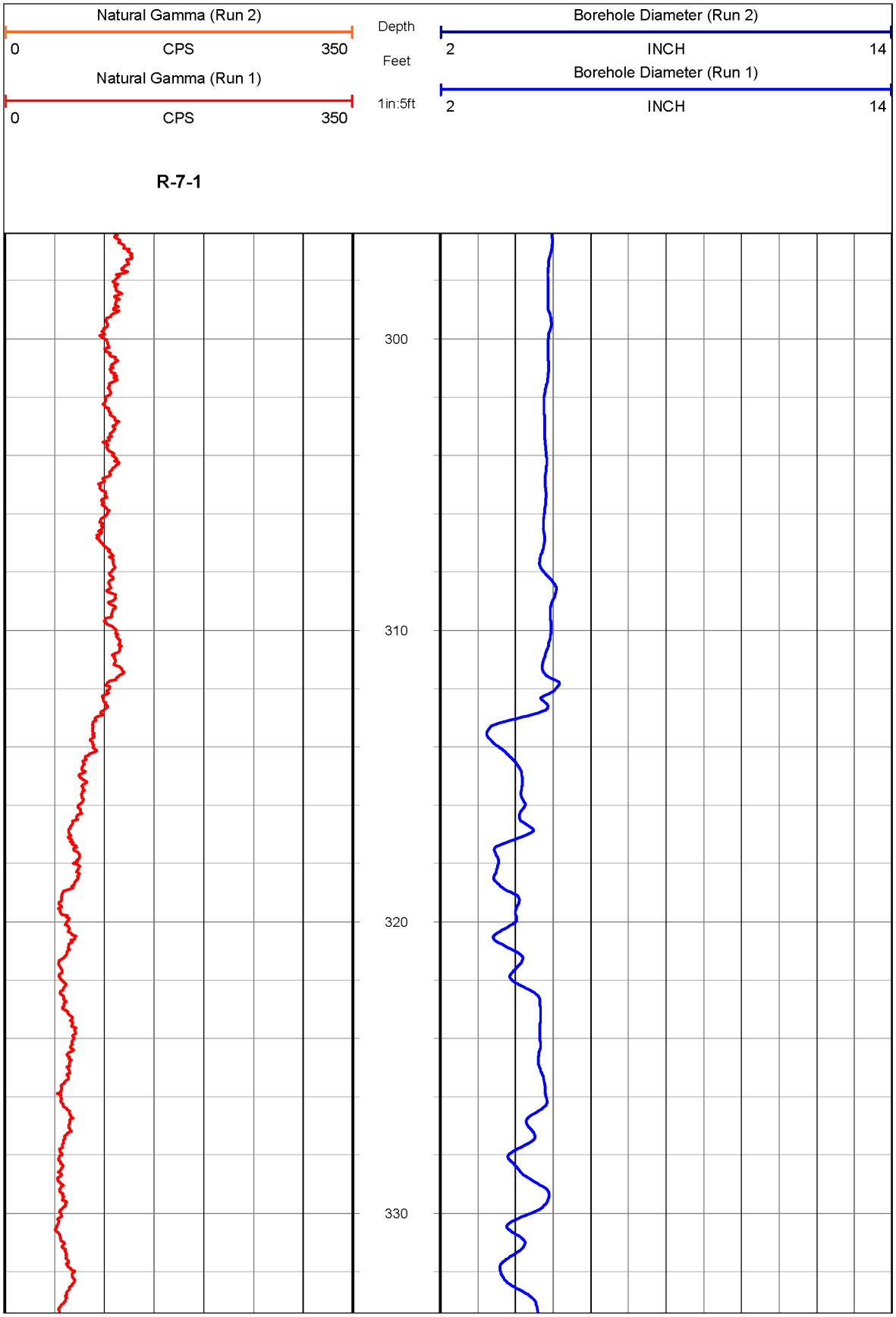

Natural Gamma (Run 2)
0
CPS
350
Natural Gamma (Run 1)
0
CPS
350
Depth
Feet
1in:5ft
Borehole Diameter (Run 2)
2
INCH
14
Borehole Diameter (Run 1)
2
INCH
14
R-7-1
120
130
140

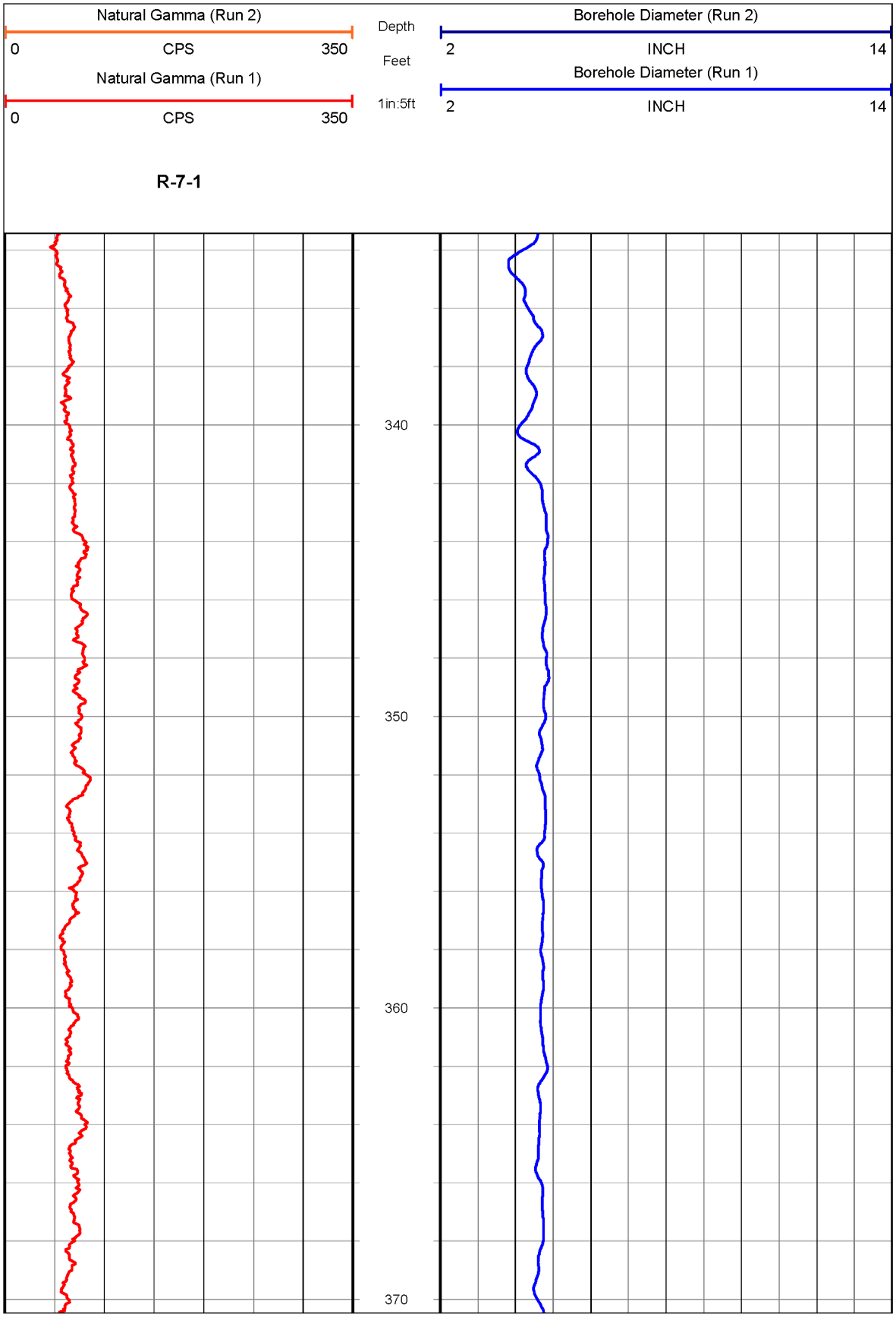

Natural Gamma (Run 2)
0
CPS
350
Natural Gamma (Run 1)
0
CPS
350
Depth
Feet
1in:5ft
Borehole Diameter (Run 2)
2
INCH
14
Borehole Diameter (Run 1)
2
INCH
14
R-7-1
150
160
170
180

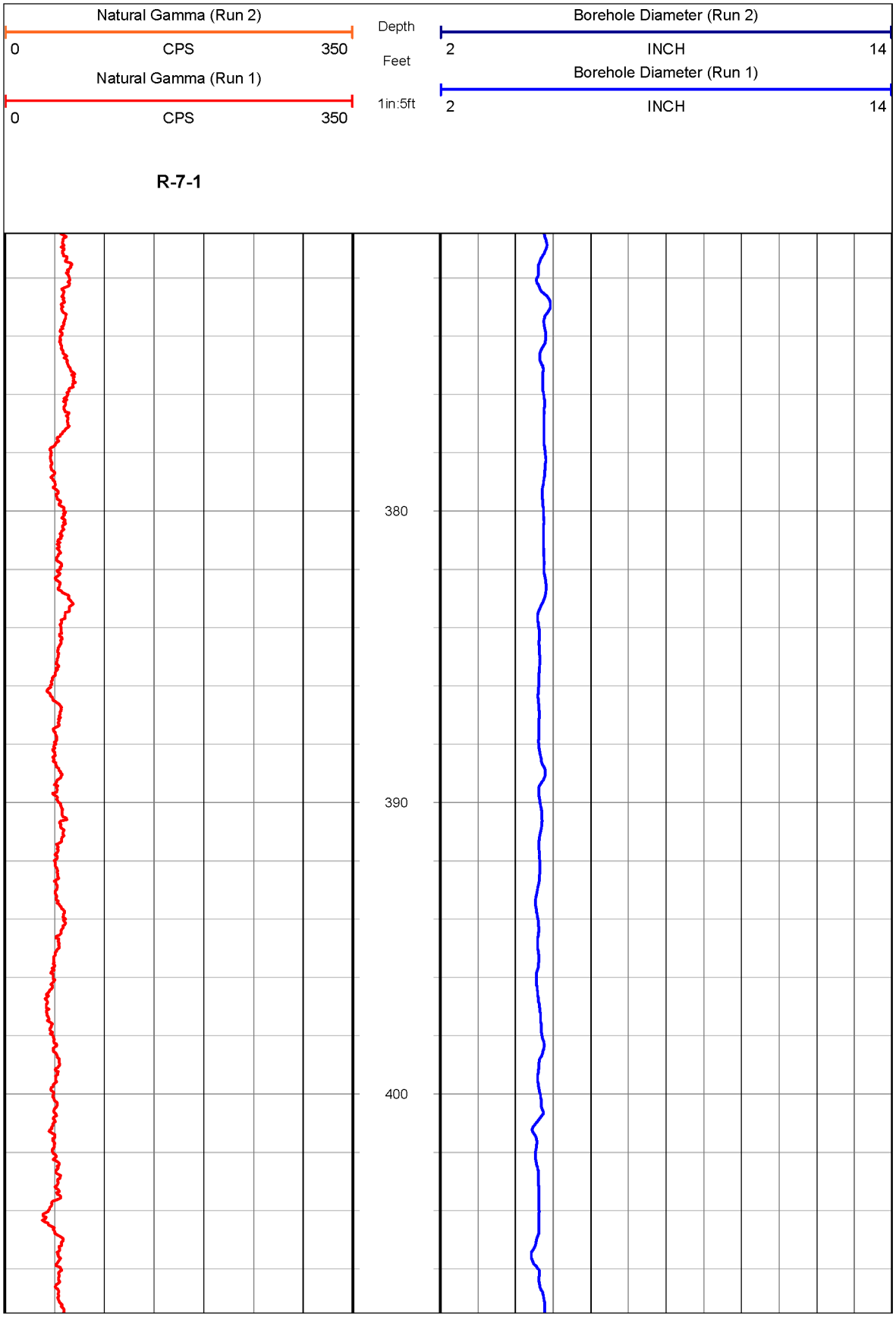

Natural Gamma (Run 2)
0
CPS
350
Natural Gamma (Run 1)
0
CPS
350
Depth
Feet
1in:5ft
Borehole Diameter (Run 2)
2
INCH
14
Borehole Diameter (Run 1)
2
INCH
14
R-7-1
190
200
210
220

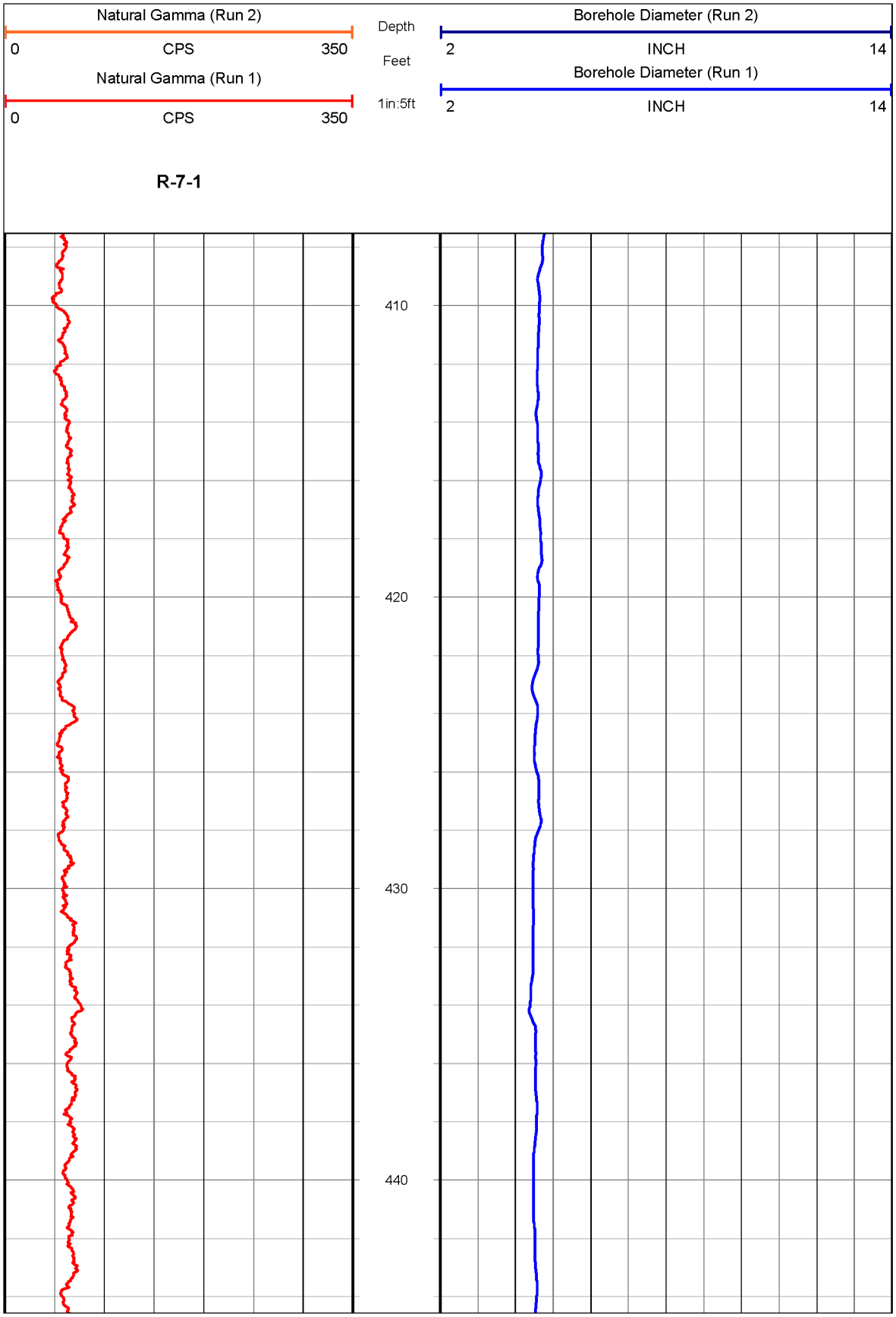

Natural Gamma (Run 2)
0
CPS
350
Natural Gamma (Run 1)
0
CPS
350
Depth
Feet
1in:5ft
Borehole Diameter (Run 2)
2
INCH
14
Borehole Diameter (Run 1)
2
INCH
14
R-7-1
230
240
250

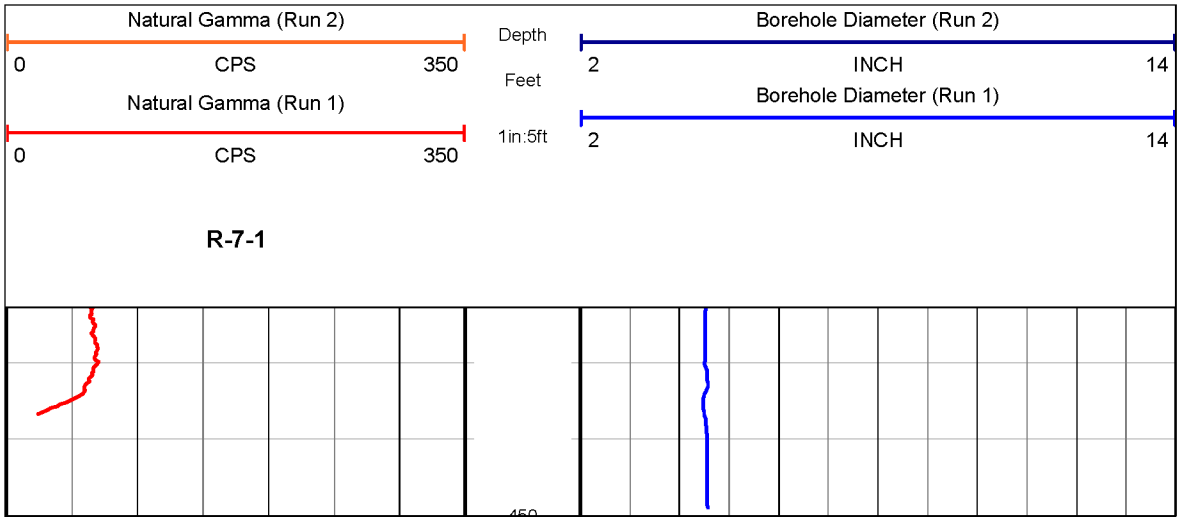

Natural Gamma (Run 2)
0
CPS
350
Natural Gamma (Run 1)
0
CPS
350
Depth
Feet
1in:5ft
Borehole Diameter (Run 2)
2
INCH
14
Borehole Diameter (Run 1)
2
INCH
14
R-7-1
260
270
280
290


Natural Gamma (Run 2)
0
CPS
350
Natural Gamma (Run 1)
0
CPS
350
Depth
Feet
1in:5ft
Borehole Diameter (Run 2)
2
INCH
14
Borehole Diameter (Run 1)
2
INCH
14
R-7-1
300
310
320
330


Natural Gamma (Run 2)
0
CPS
350
Natural Gamma (Run 1)
0
CPS
350
Depth
Feet
1in:5ft
Borehole Diameter (Run 2)
2
INCH
14
Borehole Diameter (Run 1)
2
INCH
14
R-7-1
340
350
360
370


Natural Gamma (Run 2)
0
CPS
350
Natural Gamma (Run 1)
0
CPS
350
Depth
Feet
1in:5ft
Borehole Diameter (Run 2)
2
INCH
14
Borehole Diameter (Run 1)
2
INCH
14
R-7-1
380
390
400


Natural Gamma (Run 2)
0
CPS
350
Natural Gamma (Run 1)
0
CPS
350
Depth
Feet
1in:5ft
Borehole Diameter (Run 2)
2
INCH
14
Borehole Diameter (Run 1)
2
INCH
14
R-7-1
410
420
430
440


Natural Gamma (Run 2)
0
CPS
350
Natural Gamma (Run 1)
0
CPS
350
Depth
Feet
1in:5ft
Borehole Diameter (Run 2)
2
INCH
14
Borehole Diameter (Run 1)
2
INCH
14
R-7-1

APPENDIX E

GEOPHYSICAL LOGGING SYSTEMS – NIST TRACEABLE CALIBRATION PROCEDURES AND CALIBRATION RECORDS

MICRO PRECISION CALIBRATION, INC
12686 HOOVER ST
GARDEN GROVE CA 92841
714-901-5659

Calibration CERT # 935.11

Certificate of Calibration

Date: Jun 5, 2013 **Cert No. 2200812156209**

Customer:
GEOVISION
1124 OLYMPIC DRIVE
CORONA CA 92881

Work Order #:	LA-90010807
Purchase Order #:	13161-130510-01
MPC Control #:	AM6768
Asset ID:	160024
Gage Type:	LOGGER
Manufacturer:	OYO
Model Number:	3403
Size:	N/A
Temp/RH:	71°F / 52 %
Serial Number:	160024
Department:	N/A
Performed By:	STEVE BORING
Received Condition:	IN TOLERANCE
Returned Condition:	IN TOLERANCE
Cal. Date:	May 30, 2013
Cal. Interval:	12 MONTHS
Cal. Due Date:	May 30, 2014

Calibration Notes:
See attached data sheet for calculations.
Calibrated IAW customer supplied data form Rev 2.1
Frequency measurement uncertainty = 0.0005 Hz
Unit calibrated with Laptop Panasonic s/n: 6AKSB97198

Standards Used to Calibrate Equipment

I.D.	Description.	Model	Serial	Manufacturer	Cal. Due Date	Traceability #
BD7715	UNIVERSAL COUNTER	53131A	3416A05377	HEWLETT PACKARD	Jun 8, 2013	2008120206792
BD9000	CALIBRATOR	5500A	7375008	FLUKE	Jun 15, 2013	1808504

Procedures Used in this Event

Procedure Name	Description
SUSPENSION PS SEISMIC	Logger/Recorder Calibration Procedure rev2.1

Calibrating Technician: STEVE BORING

QC Approval: Jim Williams

The reported expanded uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor k=2, which for normal distribution corresponds to a coverage probability of approximately 95%. The standard uncertainty of measurement has been determined in accordance with EA's Publication and NIST Technical Note 1297, 1994 Edition. Services rendered comply with ISO 17025:2005, ISO 9001:2008, ANSI/NCSL Z540-1, MPC Quality Manual, MPC CSD and with customer purchase order instructions.

Calibration cycles and resulting due dates were submitted/approved by the customer. Any number of factors may cause an instrument to drift out of tolerance before the next scheduled calibration. Recalibration cycles should be based on frequency of use, environmental conditions and customer's established systematic accuracy. The information on this report, pertains only to the instrument identified.

All standards are traceable to SI through the National Institute of Standards and Technology (NIST) and/or recognized national or international standards laboratories. Services rendered include proper manufacturer's service instruction and are warranted for no less than thirty (30) days. This report may not be reproduced in part or in a whole without the prior written approval of the issuing MPC lab.

GEOVision
geophysical services

SUSPENSION PS SEISMIC LOGGER/RECORDER CALIBRATION DATA FORM

INSTRUMENT DATA

System mfg.:	OYO	Model no.:	3403
Serial no.:	160024	Calibration date:	5/30/2013
By:	Charles Carter	Due date:	5/30/2014
Counter mfg.:	Hewlett Packard	Model no.:	53131A
Serial no.:	3416A05377	Calibration date:	6/8/2012
By:	Micro Precision	Due date:	6/8/2013
Signal generator mfg.:	Fluke	Model no.:	5500A
Serial no.:	7375008	Calibration date:	6/15/2012
By:	Fluke	Due date:	6/15/2013
Laptop controller mfg.:	Panasonic	Model no.:	CF-29
Serial no.:	6AKSB97198	Calibration date:	N/A

SYSTEM SETTINGS:

Gain:	2
Filter	10KHz
Range:	See sample period in table below
Delay:	0
Stack (1 std)	1
System date = correct date and time	5/30/2013 -12 hours

PROCEDURE:

Set sine wave frequency to target frequency with amplitude of approximately 0.25 volt peak
Note actual frequency on data form.
Set sample period and record data file to disk. Note file name on data form.
Pick duration of 9 cycles using PSLOG.EXE program, note duration on data form, and save as .sps file. Calculate average frequency for each channel pair and note on data form.

Average frequency must be within +/- 1% of actual frequency at all data points.

Maximum error ((AVG-ACT)/ACT*100)% As found 0.12% As left 0.12%

Target Frequency (Hz)	Actual Frequency (Hz)	Sample Period (microS)	File Name	Time for 9 cycles Hn (msec)	Average Frequency Hn (Hz)	Time for 9 cycles Hr (msec)	Average Frequency Hr (Hz)	Time for 9 cycles V (msec)	Average Frequency V (Hz)
50.00	50.00	200	1	179.8	50.06	179.8	50.06	180.2	49.94
100.0	100.00	100	2	90	100	90.1	99.89	90	100
200.0	200.00	50	3	45.05	199.8	45.05	199.8	45	200
500.0	500.00	20	4	18	500	18	500	18	500
1000	1000.00	10	5	9	1000	9	1000	9	1000
2000	2000.00	5	6	4.5	2000	4.5	2000	4.5	2000

Calibrated by: STEVE BORING 5/30/2013 [signature]
Name Date Signature

Witnessed by: Charles Carter 5/30/2013 Charles Carter
Name Date Signature

APPENDIX F

BORING GEOPHYSICAL LOGGING FIELD DATA LOGS

GEOVision
geophysical services

R-6-1a-A BORING GEOPHYSICS FIELD LOG SUMMARY

Borehole*

SITE*: Turkey Point NPP DATE*: 10/16/2013
CLIENT*: Paul C. Rizzo Associates, Inc. JOB*: 13331
AUTHOR*: C. Carter PAGE*: 1 OF 1

CONTACT: Rolando J. Benitez PHONE: (412) 607-3560

BOREHOLE CONSTRUCTION: CASED X UNCASED ____
DIAMETERS AND DEPTH RANGES: 2" PVC 0 TO 120 ft ; ____, ____ TO ____
BOREHOLE TOTAL DEPTH AS DRILLED*: 120 ft
SURFACE CASING?: YES____ DEPTH TO BOTTOM OF CASING____; NO X
DEPTH TO BEDROCK: ~5 ft
BOREHOLE FLUID: WATER X; FRESH WATER MUD____; SALT WATER MUD ____;

LOGGING CREW: C. Carter

LOG TYPE*	FILE NAME*	DEPTH RANGE*	DATE*	TIMES*
Deviation	R61AAAUDOWN01	3.6-106.5 ft	10/16/2013	8:02-8:08 am
Deviation	R61AAAUUP01	106.1-3.0 ft	10/16/2013	8:09-8:15 am

*ITEMS WITH * MUST BE COMPLETED. OTHER INFORMATION IS OPTIONAL*

GEOVision
geophysical services

R-6-1a-A
Borehole*

ACOUSTIC TELEVIEWER FIELD LOG

Procedure ASTM D5753-10 Borehole Geophysical
GEOVision HI-RAT Field Procedure Rev 2.00a

SITE*: Turkey Point NPP DATE*: 10/16/2013
CLIENT*: Paul C. Rizzo Associates, Inc. JOB*:13331
AUTHOR*: C. Carter PAGE: 1 OF 2
REVIEWER: _____ (post field work)

CONTACT: _____ PHONE: Off Cell

CONTACT: _____ PHONE: Off Cell

DRILLER _____ PHONE: Off Cell
COMPANY: _____

GENERAL SITE CONDITIONS/LOCATION: _____

COUNTY: _____ RANGE: _____ TOWNSHIP: _____ SECTION: _____
BOREHOLE CONSTRUCTION: CASED x UNCASED _____
DIAMETERS AND DEPTH RANGES: 2" PVC 0 TO 120 ft ; _____, _____ TO _____

BOREHOLE TOTAL DEPTH AS DRILLED*: 120 ft

SURFACE CASING?: YES ____ DEPTH TO BOTTOM OF CASING _____ ; NO x
DEPTH TO BEDROCK: ~5 ft DEPTH TO WATER TABLE: Ø
BOREHOLE FLUID: WATER ____; FRESH WATER MUD ____; SALT WATER MUD
OTHER:
DEPTH TO BOREHOLE FLUID: Ø TIME SINCE LAST CIRCULATION: N/A

LOGGING CREW: C. Carter
VEHICLE(S) USED AND MILEAGE:
MOBILIZED FROM: Florida City DEPARTURE TIME: 6:30
ARRIVED ON SITE: 7:00 am
STANDBY TIME: _____ CAUSE: _____

*ITEMS WITH * MUST BE COMPLETED. OTHER INFORMATION IS OPTIONAL*

GEOVision
geophysical services

ACOUSTIC TELEVIEWER FIELD LOG

R-6-1a-A
Borehole*

Procedure ASTM D5753-10 Borehole Geophysical
GEOVision HI-RAT Field Procedure Rev 2.00a

SITE*: Turkey Point NPP
DATE*: 10/16/2013
CLIENT*: Paul C. Rizzo Associates, Inc.
JOB*: 13331
AUTHOR*: C. Carter
PAGE: 2 OF 2
REVIEWER: _____ (post field work)

WINCH ARIES ☐ SILVER ☑ OYO ☐ RG ☐ OTHER _____
MICROLOGGER* 8083 ☐ 5772 ☒ OTHER _____
TELEVIEWER* 5174 ☐ 6641 ☑ OTHER _____
SHEAVE* OYO 101 ☐ 102 ☐ 103 ☐ 104 ☐ Other _____ RG ☒

All GEOVision Televiewer probes are made by Robertson Geologging, Ltd. of Deganwy, Conwy, UK

PROBE TILT TEST* 90.52 BRUNTON TILT* 90 +/-2°
PROBE TILT TEST* 23.77 BRUNTON TILT* 24 +/-2°
PROBE TILT TEST* 56.41 BRUNTON TILT* 57 AFTER LOG* yes
PROBE AZIMUTH TEST* 342.20 BRUNTON AZIMUTH* 338 +/-10°
PROBE AZIMUTH TEST* 28.30 BRUNTON AZIMUTH* 31 +/-10°
PROBE AZIMUTH TEST* 324.30 BRUNTON AZIMUTH* 320 AFTER LOG* yes

PROBE OFFSET*	1.44M(4.72FT)	
MINUS CASING STICK-UP*	1.17	REF TO GROUND SURFACE
DEPTH REF. OFFSET AT START*	3.55	REF TO GROUND SURFACE
DEPTH REF. OFFSET AT END*	3.54	REF TO GROUND SURFACE
AFTER SURVEY DEPTH ERROR*	0.01	allow +/-0.4% of total depth

LOG NAME*	START DEPTH*	START TIME	END DEPTH *	END TIME
RG1AAAUDOWN01	3.6 ft	8:02	106.5 ft	8:08am
RG1AAAUUP01	106.1	8:09	3.0 ft	8:15am

MAINTENANCE PERFORMED ON SITE*: N/A (N/A if none)

DEVIATION FROM PROCEDURE (IF ANY) OR EQUIPMENT PROBLEMS OR FAILURES* (N/A if none)
N/A

DATA STORED IN TWO PLACES BEFORE DEPARTURE? ☐ YES. DESCRIBE: CD (USB DRIVE)
OTHER _____

*ITEMS WITH * MUST BE COMPLETED. OTHER INFORMATION IS OPTIONAL*

GEOVision
geophysical services

R-6-1b BORING GEOPHYSICS FIELD LOG SUMMARY

Borehole*

SITE*: Turkey Point NPP DATE*: 10/14, 15/2013, 10/16/2013

CLIENT*: Paul C. Rizzo Associates, Inc. JOB*: 13331

AUTHOR*: C. Carter PAGE*: 1 OF 1

CONTACT: Rolando J. Benitez PHONE: (412) 607-3560

BOREHOLE CONSTRUCTION: CASED ____ UNCASED X

DIAMETERS AND DEPTH RANGES: 5 3/4 0 TO 110 ft ; ~~4 3/4~~ 5" 110 TO 464 ft cc 10/14/13

BOREHOLE TOTAL DEPTH AS DRILLED*: 464 ft

SURFACE CASING?: YES X 10/14-15 DEPTH TO BOTTOM OF CASING 110 ft ; NO X 10/16

DEPTH TO BEDROCK: ~5 ft

BOREHOLE FLUID: WATER ____; FRESH WATER MUD X ; SALT WATER MUD ____;

LOGGING CREW: C. Carter

LOG TYPE*	FILE NAME*	DEPTH RANGE*	DATE*	TIMES*
Deviation	R6IBAUDOWN01	3.2 - 464 ft	10/14/2013	2:14 - 2:27 pm
ATV	R6IBAUUP01	463.8 - 109 ft	10/14/2013	2:30 - 4:09 pm
P-S velocity	R6IBSUSPDOWN01	34.0 - 137.0 m	10/14/2013	4:46 - 6:30 pm
Caliper	R6IBCALTEST01	N/A	10/15/2013	8:39 - 8:40 am
Cal - NG	R6IBCALUP01	455.7 - 99.65 ft	10/15/2013	9:15 - 9:45 am
Caliper	R6IBCALTEST02	N/A	10/15/2013	10:02 - 10:04 am
Deviation	R6IBAUDOWN02	1.9 - 113.5 ft	10/16/2013	9:13 - 9:24 am
ATV	R6IBAUUP02 ~~9:25-10:03~~ cc 10/16/13			
ATV	R6IBAUUP02	113.5 - 1.6 ft	10/16/2013	9:25 - 10:03 am
P-S velocity	R6IBSUSPDOWN02	2.0 - 35.0 m	10/16/2013	10:27 - 11:01 am
Caliper	R6IBCALTEST03	N/A	10/16/2013	11:24 - 11:26 am
Cal - NG	R6IBCALUP02	116.7 - 3.35 ft	10/16/2013	11:37 - 11:48 am
Caliper	R6IBCALTEST04	N/A	10/16/2013	11:55 - 11:56 am

10/16

*ITEMS WITH * MUST BE COMPLETED. OTHER INFORMATION IS OPTIONAL*

GEOVision
geophysical services

R-6-1b
Borehole*

ACOUSTIC TELEVIEWER FIELD LOG

Procedure ASTM D5753-10 Borehole Geophysical
GEOVision HI-RAT Field Procedure Rev 2.00a

SITE*: Turkey Point NPP DATE*: 10/14/2013
CLIENT*: Paul C. Rizzo Associates, Inc. JOB*:13331
AUTHOR*: C. Carter PAGE: 1 OF 2
REVIEWER: _____ (post field work)

CONTACT: _____ PHONE: Off Cell

CONTACT: _____ PHONE: Off Cell

DRILLER _____ PHONE: Off Cell
COMPANY: _____

GENERAL SITE CONDITIONS/LOCATION: _____

COUNTY: _____ RANGE: _____ TOWNSHIP: _____ SECTION: _____
BOREHOLE CONSTRUCTION: CASED ____ UNCASED X
DIAMETERS AND DEPTH RANGES: 5 3/4" 0 TO 110 ft ; 5", 110 TO 464 ft

BOREHOLE TOTAL DEPTH AS DRILLED*: 464 ft

SURFACE CASING?: YES X DEPTH TO BOTTOM OF CASING 110 ft ; NO
DEPTH TO BEDROCK: 5 ft DEPTH TO WATER TABLE: Ø
BOREHOLE FLUID: WATER ____ ; FRESH WATER MUD X ; SALT WATER MUD
OTHER: _____
DEPTH TO BOREHOLE FLUID: < 5 ft TIME SINCE LAST CIRCULATION: 2:00pm

LOGGING CREW: C. Carter
VEHICLE(S) USED AND MILEAGE: _____
MOBILIZED FROM: Florida City DEPARTURE TIME: 6:30 am
ARRIVED ON SITE: 7:00 am
STANDBY TIME: Ø CAUSE: _____

*ITEMS WITH * MUST BE COMPLETED. OTHER INFORMATION IS OPTIONAL*

GEOVision
geophysical services

ACOUSTIC TELEVIEWER FIELD LOG

R-6-1b
Borehole*

Procedure ASTM D5753-10 Borehole Geophysical
GEOVision HI-RAT Field Procedure Rev 2.00a

SITE*: Turkey Point NPP
DATE*: 10/14/2013
CLIENT*: Paul C. Rizzo Associates, Inc. JOB*: 13331
AUTHOR*: C. Carter
PAGE: 2 OF 2
REVIEWER: _____ (post field work)

WINCH ARIES ☐ SILVER ☒ OYO ☐ RG ☐ OTHER _____
MICROLOGGER* 8083 ☐ 5772 ☒ OTHER _____
TELEVIEWER* 5174 ☐ 6641 ☒ OTHER _____
SHEAVE* OYO 101 ☐ 102 ☐ 103 ☐ 104 ☐ Other _____ RG ☒

All GEOVision Televiewer probes are made by Robertson Geologging, Ltd. of Deganwy, Conwy, UK

PROBE TILT TEST* 90.22 BRUNTON TILT* 90 +/-2°
PROBE TILT TEST* 24.97 BRUNTON TILT* 25 +/-2°
PROBE TILT TEST* 73.28 BRUNTON TILT* 73 AFTER LOG* yes
PROBE AZIMUTH TEST* 183.70 BRUNTON AZIMUTH* 184 +/-10°
PROBE AZIMUTH TEST* 268.00 BRUNTON AZIMUTH* 260 +/-10°
PROBE AZIMUTH TEST* 182.00 BRUNTON AZIMUTH* 181 AFTER LOG* yes

PROBE OFFSET*	1.44M(4.72FT)	
MINUS CASING STICK-UP*	1.61	REF TO GROUND SURFACE
DEPTH REF. OFFSET AT START*	3.11	REF TO GROUND SURFACE
DEPTH REF. OFFSET AT END*	2.83	REF TO GROUND SURFACE
AFTER SURVEY DEPTH ERROR*	0.28	allow +/-0.4% of total depth

LOG NAME*	START DEPTH*	START TIME	END DEPTH *	END TIME
R6IBAUDOWN01	3.2	2:14	464 ft	2:27pm
R6IBAUUP01	463.8	2:30	109 ft	4:09pm

MAINTENANCE PERFORMED ON SITE*: N/A (N/A if none)

DEVIATION FROM PROCEDURE (IF ANY) OR EQUIPMENT PROBLEMS OR FAILURES* (N/A if none)
N/A

DATA STORED IN TWO PLACES BEFORE DEPARTURE? ☐ YES. DESCRIBE: CD USB DRIVE
OTHER _____

*ITEMS WITH * MUST BE COMPLETED. OTHER INFORMATION IS OPTIONAL*

GEOVision geophysical services

R-6-1b

P-S SUSPENSION VELOCITY FIELD LOG REV 1.5

Borehole

CORRESPONDING P-S SUSPENSION PROCEDURE REV 1.5

SITE*: Turkey Point NPP DATE*: 10/14, 16/2013

CLIENT*: Paul C. Rizzo Associates, Inc. JOB*: 13331

AUTHOR*: C. Carter PAGE 1 OF * 9

CONTACT: _____ PHONE: Off Cell _____

CONTACT: _____ PHONE: Off Cell _____

CONTACT: _____ PHONE: Off Cell _____

CONTACT: _____ PHONE: Off Cell _____

DIRECTIONS TO SITE: _____

GENERAL SITE CONDITIONS/LOCATION: _____

COUNTY: _____ RANGE: _____ TOWNSHIP: _____ SECTION: _____

BOREHOLE CONSTRUCTION*: CASED _____ UNCASED X

DIAMETERS AND DEPTH RANGES*: 5 3/4" 0 TO 110 ft ; 5", 110 TO 464 ft

BOREHOLE TOTAL DEPTH AS DRILLED*: 464 ft

SURFACE CASING?: yes (10/14) DEPTH TO BOTTOM OF CASING 110 ft ; NO X 10/16

DEPTH TO BEDROCK: ~5 ft DEPTH TO WATER TABLE: Ø

BOREHOLE FLUID: WATER_____; FRESH WATER MUD X ; SALT WATER MUD;_____

OTHER: _____

DEPTH TO BOREHOLE FLUID*: Ø TIME SINCE LAST CIRCULATION: 2pm 10/14, 8am 10/16

*ITEMS WITH * MUST BE COMPLETED. OTHER INFORMATION IS OPTIONAL*

P-S FIELD LOG REV V1.5

GEOVision geophysical services

R-6-1b P-S SUSPENSION VELOCITY FIELD LOG REV 1.5

Borehole

CORRESPONDING P-S SUSPENSION PROCEDURE REV 1.5

SITE*: Turkey Point NPP DATE*: 10/14, 16/2013

CLIENT*: Paul C. Rizzo Associates, Inc. JOB*: 13331

AUTHOR*: C. Carter PAGE 2 OF * 9

LOGGING CREW*: C. Carter

MOBILIZED FROM: Florida City DEPARTURE TIME:

ARRIVED ON SITE:

STANDBY TIME: CAUSE:

LOGGING STARTED: LOGGING COMPLETED:

BATTERIES CHANGED BEFORE LOGGING: YES ; NO X ; STORED WITH NEW

WINCH COMPROBE ☐ GREY ☒ OYO ☐ RG ☐ OTH

CALIBRATED INSTRUMENT*	RG LOGGER/RECORDER		OYO LOGGER/RECORDER		
	160023 ☐	160024 ☒	12004 ☐	15014 ☐	19029 ☐

MICROLOGGER* 8083 ☐ 5772 ☒ NO MICROLOGGER (OYO) ☐

RECEIVER S/N* 12008 ☐ 20042 ☐ 26066 ☐ 11001 ☐ 23053 ☐ 30086 ☒

ISOLATION TUBE S/N* 300083 ☐ 24053 ☒ 28068 ☐ 28072 ☐ 2M

SHEAVE* COMPROBE ☐ OYO 101 ☐ 102 ☐ 103 ☐ RG ☒

PROBE OFFSET* OYO 2.0M ☐ RG 2.5M ☒

MINUS CASING STICK-UP*	0.49	0.49	REF TO GROUND SURFACE
DEPTH REF. OFFSET AT START*	2.01	2.01	
DEPTH REF. OFFSET AT END*	1.96	1.99	
AFTER SURVEY DEPTH ERROR*	.04	0.02	

LOG NAME*	START DEPTH*	START TIME	END DEPTH *	END TIME	
R6Ib SUSP DOWN 01	34.0m	4:46pm	137.0m	6:30pm	10/14
R6IB SUSP DOWN 02	2.0m	10:27	35.0m	11:01 am	10/16

MAINTENANCE PERFORMED ON SITE*: N/A (N/A if none)

EQUIPMENT PROBLEMS OR FAILURES*: N/A (N/A if none)

DEVIATIONS FROM TEST PLAN*: N/A (N/A if none)

*ITEMS WITH * MUST BE COMPLETED. OTHER INFORMATION IS OPTIONAL*

P-S FIELD LOG REV 1.5

R-6-16

GEOVISION SUSPENSION LOGGING FIELD NOTES

SITE*: Turkey Point NPP DATE*: 10/16/2013

CLIENT*: Paul C. Rizzo Associates, Inc. JOB*: 13331

AUTHOR*: C. Carter PAGE* 3 OF 9

*ITEMS WITH * MUST BE COMPLETED. OTHER INFORMATION IS OPTIONAL*

DEPTH METERS	DEPTH FEET	UNFILTERED FILE NO*.	FILTERED FILE NO*. (if any)	COMMENTS CASING, WATER, ROCK, ETC
0.5	1.64			
1.0	3.28			
1.5	4.92			
2.0	6.56	208		10:27
2.5	8.20	209		
3.0	9.84	210		
3.5	11.48	211		
4.0	13.12	212		
4.5	14.76	213		
5.0	16.40	214		
5.5	18.04	215		
6.0	19.69	216		
6.5	21.33	217		
7.0	22.97	218		
7.5	24.61	219		
8.0	26.25	220		
8.5	27.89	221		
9.0	29.53	222		
9.5	31.17	223		
10.0	32.81	224		
10.5	34.45	225		
11.0	36.09	226		
11.5	37.73	227		
12.0	39.37	228		
12.5	41.01	229		
13.0	42.65	230		
13.5	44.29	231		
14.0	45.93	232		
14.5	47.57	233		
15.0	49.21	234		
15.5	50.85	235		
16.0	52.49	236		
16.5	54.13	237		
17.0	55.77	238		
17.5	57.41	239		
18.0	59.06	240		
18.5	60.70	241		
19.0	62.34	242		
19.5	63.98	243		
20.0	65.62	244		

P-S FIELD LOG REV 1.5

R-6-66

GEOVISION SUSPENSION LOGGING FIELD NOTES

SITE*: Turkey Point NPP DATE*: 10/14/2013, 10/16/2013

CLIENT*: Paul C. Rizzo Associates, Inc. JOB*: 13331

AUTHOR*: C. Carter PAGE* 4 OF 9

*ITEMS WITH * MUST BE COMPLETED. OTHER INFORMATION IS OPTIONAL*

DEPTH METERS	DEPTH FEET	UNFILTERED FILE NO*.	FILTERED FILE NO*. (if any)	COMMENTS CASING, WATER, ROCK, ETC
20.5	67.26	245		
21.0	68.90	246		
21.5	70.54	247		
22.0	72.18	248		
22.5	73.82	249		
23.0	75.46	250		
23.5	77.10	251		
24.0	78.74	252		
24.5	80.38	253		
25.0	82.02	254		
25.5	83.66	255		
26.0	85.30	256		
26.5	86.94	257		
27.0	88.58	258		
27.5	90.22	259		
28.0	91.86	260		
28.5	93.50	261		
29.0	95.14	262		
29.5	96.78	263		
30.0	98.43	264		
30.5	100.07	265		
31.0	101.71	266		
31.5	103.35	267		
32.0	104.99	268		
32.5	106.63	269		
33.0	108.27	270		
33.5	109.91	271		
34.0	111.55	501 272		4:46 10/14
34.5	113.19	2 273		
35.0	114.83	3 274		18:01 10/16
35.5	116.47	4		
36.0	118.11	5		
36.5	119.75	6		
37.0	121.39	7		
37.5	123.03	8		
38.0	124.67	9		
38.5	126.31	10		
39.0	127.95	11		
39.5	129.59	12		
40.0	131.23	13		

P-S FIELD LOG REV 1.5

R-6-1b

GEOVISION SUSPENSION LOGGING FIELD NOTES

SITE*: Turkey Point NPP DATE*: 10/14/2013

CLIENT*: Paul C. Rizzo Associates, Inc. JOB*: 13331

AUTHOR*: C. Carter PAGE* 5 OF 9

*ITEMS WITH * MUST BE COMPLETED. OTHER INFORMATION IS OPTIONAL*

DEPTH METERS	DEPTH FEET	UNFILTERED FILE NO*.	FILTERED FILE NO*. (if any)	COMMENTS CASING, WATER, ROCK, ETC
40.5	132.87	14		
41.0	134.51	15		
41.5	136.15	16		
42.0	137.80	17		
42.5	139.44	18		
43.0	141.08	19		
43.5	142.72	20		
44.0	144.36	21		
44.5	146.00	22		
45.0	147.64	23		
45.5	149.28	24		
46.0	150.92	25		
46.5	152.56	26		
47.0	154.20	27		
47.5	155.84	28		
48.0	157.48	29		
48.5	159.12	30		
49.0	160.76	31		
49.5	162.40	32		
50.0	164.04	33		
50.5	165.68	34		
51.0	167.32	35		
51.5	168.96	36		
52.0	170.60	37		
52.5	172.24	38		
53.0	173.88	39		
53.5	175.52	40		
54.0	177.17	41		
54.5	178.81	42		
55.0	180.45	43		
55.5	182.09	44		
56.0	183.73	45		
56.5	185.37	46		
57.0	187.01	47		
57.5	188.65	48		
58.0	190.29	49		
58.5	191.93	50		
59.0	193.57	51		
59.5	195.21	52		
60.0	196.85	53		

P-S FIELD LOG REV 1.5

R-6-1b

GEOVISION SUSPENSION LOGGING FIELD NOTES

SITE*: Turkey Point NPP DATE*: 10/14/2013

CLIENT*: Paul C. Rizzo Associates, Inc. JOB*: 13331

AUTHOR*: C. Carter PAGE* 6 OF 9

*ITEMS WITH * MUST BE COMPLETED. OTHER INFORMATION IS OPTIONAL*

DEPTH METERS	DEPTH FEET	UNFILTERED FILE NO*.	FILTERED FILE NO*. (if any)	COMMENTS CASING, WATER, ROCK, ETC
60.5	198.49	54		
61.0	200.13	55		
61.5	201.77	56		
62.0	203.41	57		
62.5	205.05	58		
63.0	206.69	59		
63.5	208.33	60		
64.0	209.97	61		
64.5	211.61	62		
65.0	213.25	63		
65.5	214.90	64		
66.0	216.54	65		
66.5	218.18	66		
67.0	219.82	67		
67.5	221.46	68		
68.0	223.10	69		
68.5	224.74	70		
69.0	226.38	71		
69.5	228.02	72		
70.0	229.66	73		
70.5	231.30	74		
71.0	232.94	75		
71.5	234.58	76		
72.0	236.22	77		
72.5	237.86	78		
73.0	239.50	79		
73.5	241.14	80		
74.0	242.78	81		
74.5	244.42	82		
75.0	246.06	83		
75.5	247.70	84		
76.0	249.34	85		
76.5	250.98	86		
77.0	252.62	87		
77.5	254.27	88		
78.0	255.91	89		
78.5	257.55	90		
79.0	259.19	91		
79.5	260.83	92		
80.0	262.47	93		

R-6-16

GEOVISION SUSPENSION LOGGING FIELD NOTES

SITE*: Turkey Point NPP DATE*: 10/14/2013

CLIENT*: Paul C. Rizzo Associates, Inc. JOB*: 13331

AUTHOR*: C. Carter PAGE* 7 OF 9

*ITEMS WITH * MUST BE COMPLETED. OTHER INFORMATION IS OPTIONAL*

DEPTH METERS	DEPTH FEET	UNFILTERED FILE NO*.	FILTERED FILE NO*. (if any)	COMMENTS CASING, WATER, ROCK, ETC
80.5	264.11	94		
81.0	265.75	95		
81.5	267.39	96		
82.0	269.03	97		
82.5	270.67	98		
83.0	272.31	99		
83.5	273.95	100		
84.0	275.59	101		
84.5	277.23	102		
85.0	278.87	103		
85.5	280.51	104		
86.0	282.15	105		
86.5	283.79	106		
87.0	285.43	107		
87.5	287.07	108		
88.0	288.71	109		
88.5	290.35	110		
89.0	291.99	111		
89.5	293.64	112		
90.0	295.28	113		
90.5	296.92	114		
91.0	298.56	115		
91.5	300.20	116		
92.0	301.84	117		
92.5	303.48	118		
93.0	305.12	119		
93.5	306.76	120		
94.0	308.40	121		
94.5	310.04	122		
95.0	311.68	123		
95.5	313.32	124		
96.0	314.96	125		
96.5	316.60	126		
97.0	318.24	127		
97.5	319.88	128		
98.0	321.52	129		
98.5	323.16	130		
99.0	324.80	131		
99.5	326.44	132		
100.0	328.08	133		

P-S FIELD LOG REV 1.5

R-6-16 **GEOVISION SUSPENSION LOGGING FIELD NOTES**

SITE*: Turkey Point NPP DATE*: 10/14/2013

CLIENT*: Paul C. Rizzo Associates, Inc. JOB*: 13331

AUTHOR*: C. Carter PAGE* 8 OF 9

*ITEMS WITH * MUST BE COMPLETED. OTHER INFORMATION IS OPTIONAL*

DEPTH METERS	DEPTH FEET	UNFILTERED FILE NO*.	FILTERED FILE NO*. (if any)	COMMENTS CASING, WATER, ROCK, ETC
100.5	329.72	134		
101.0	331.36	135		
101.5	333.01	136		
102.0	334.65	137		
102.5	336.29	138		
103.0	337.93	139		
103.5	339.57	140		
104.0	341.21	141		
104.5	342.85	142		
105.0	344.49	143		
105.5	346.13	144		
106.0	347.77	145		
106.5	349.41	146		
107.0	351.05	147		
107.5	352.69	148		
108.0	354.33	149		
108.5	355.97	150		
109.0	357.61	151		
109.5	359.25	152		
110.0	360.89	153		
110.5	362.53	154		
111.0	364.17	155		
111.5	365.81	156		
112.0	367.45	157		
112.5	369.09	158		
113.0	370.73	159		
113.5	372.38	160		
114.0	374.02	161		
114.5	375.66	162		
115.0	377.30	163		
115.5	378.94	164		
116.0	380.58	165		
116.5	382.22	166		
117.0	383.86	167		
117.5	385.50	168		
118.0	387.14	169		
118.5	388.78	170		
119.0	390.42	171		
119.5	392.06	172		
120.0	393.70	173		

P-S FIELD LOG REV 1.5

R-6-1b

GEOVISION SUSPENSION LOGGING FIELD NOTES

SITE*: Turkey Point NPP DATE*: 10/14/2013

CLIENT*: Paul C. Rizzo Associates, Inc. JOB*: 13331

AUTHOR*: C. Carter PAGE* 9 OF 9

*ITEMS WITH * MUST BE COMPLETED. OTHER INFORMATION IS OPTIONAL*

DEPTH METERS	DEPTH FEET	UNFILTERED FILE NO*.	FILTERED FILE NO*. (if any)	COMMENTS CASING, WATER, ROCK, ETC
120.5	395.34	174		
121.0	396.98	175		
121.5	398.62	176		
122.0	400.26	177		
122.5	401.90	178		
123.0	403.54	179		
123.5	405.18	180		
124.0	406.82	181		
124.5	408.46	182		
125.0	410.10	183		
125.5	411.75	184		
126.0	413.39	185		
126.5	415.03	186		
127.0	416.67	187		
127.5	418.31	188		
128.0	419.95	189		
128.5	421.59	190		
129.0	423.23	191		
129.5	424.87	192		
130.0	426.51	193		
130.5	428.15	194		
131.0	429.79	195		
131.5	431.43	196		
132.0	433.07	197		
132.5	434.71	198		
133.0	436.35	199		
133.5	437.99	200		
134.0	439.63	201		
134.5	441.27	202		
135.0	442.91	203		
135.5	444.55	204		
136.0	446.19	205		
136.5	447.83	206		
137.0	449.48	207		6:30
137.5	451.12			
138.0	452.76			
138.5	454.40			
139.0	456.04			
139.5	457.68			
140.0	459.32			

GEOVision
geophysical services

R-6-Lb
Borehole*

ACOUSTIC TELEVIEWER FIELD LOG

Procedure ASTM D5753-10 Borehole Geophysical
GEOVision HI-RAT Field Procedure Rev 2.00a

SITE*: Turkey Point NPP DATE*: 10/16/2013
CLIENT*: Paul C. Rizzo Associates, Inc. JOB*:13331
AUTHOR*: C. Carter PAGE: 1 OF 2
REVIEWER: _____ (post field work)

CONTACT: _____ PHONE: Off Cell

CONTACT: _____ PHONE: Off Cell

DRILLER _____ PHONE: Off Cell
COMPANY: _____

GENERAL SITE CONDITIONS/LOCATION: _____

COUNTY: _____ RANGE: _____ TOWNSHIP: _____ SECTION: _____
BOREHOLE CONSTRUCTION: CASED ____ UNCASED X
DIAMETERS AND DEPTH RANGES: 5 3/4" 0 TO 110 ft ; 5", 110 TO 464 ft

BOREHOLE TOTAL DEPTH AS DRILLED*: 464 ft

SURFACE CASING?: YES ____ DEPTH TO BOTTOM OF CASING ____ ; NO X
DEPTH TO BEDROCK: 5 ft DEPTH TO WATER TABLE: Ø
BOREHOLE FLUID: WATER ____ ; FRESH WATER MUD X ; SALT WATER MUD ____
OTHER: ____
DEPTH TO BOREHOLE FLUID: Ø TIME SINCE LAST CIRCULATION: 8am

LOGGING CREW: C. Carter
VEHICLE(S) USED AND MILEAGE: ____
MOBILIZED FROM: Florida City DEPARTURE TIME: 6:30
ARRIVED ON SITE: 7:00am
STANDBY TIME: ____ CAUSE: ____

*ITEMS WITH * MUST BE COMPLETED. OTHER INFORMATION IS OPTIONAL*

GEOVision
geophysical services

ACOUSTIC TELEVIEWER FIELD LOG

R-6-1b
Borehole*

Procedure ASTM D5753-10 Borehole Geophysical
GEOVision HI-RAT Field Procedure Rev 2.00a

SITE*: Turkey Point NPP
DATE*: 10/16/2013
CLIENT*: Paul C. Rizzo Associates, Inc.
JOB*: 13331
AUTHOR*: C. Carter
PAGE: 2 OF 2
REVIEWER: _____ (post field work)

WINCH ARIES ☐ SILVER ☒ OYO ☐ RG ☐ OTHER _____
MICROLOGGER* 8083 ☐ 5772 ☒ OTHER _____
TELEVIEWER* 5174 ☐ 6641 ☒ OTHER _____
SHEAVE* OYO 101 ☐ 102 ☐ 103 ☐ 104 ☐ Other _____ RG ☒

All GEOVision Televiewer probes are made by Robertson Geologging, Ltd. of Deganwy, Conwy, UK

PROBE TILT TEST* 56.41 BRUNTON TILT* 57 +/-2°
PROBE TILT TEST* 90.50 BRUNTON TILT* 90 +/-2°
PROBE TILT TEST* 59.46 BRUNTON TILT* 59 AFTER LOG* yes
PROBE AZIMUTH TEST* 324.30 BRUNTON AZIMUTH* 320 +/-10°
PROBE AZIMUTH TEST* 28.30 BRUNTON AZIMUTH* 31 +/-10°
PROBE AZIMUTH TEST* 205.90 BRUNTON AZIMUTH* 202 AFTER LOG* yes

PROBE OFFSET*	1.44M(4.72FT)	
MINUS CASING STICK-UP*	1.61	REF TO GROUND SURFACE
DEPTH REF. OFFSET AT START*	1.61 *	REF TO GROUND SURFACE
DEPTH REF. OFFSET AT END*	1.58	REF TO GROUND SURFACE
AFTER SURVEY DEPTH ERROR*	0.03	allow +/-0.4% of total depth

LOG NAME*	START DEPTH*	START TIME	END DEPTH *	END TIME
R61BAUDOWN02	1.9	9:13	113.5 ft	9:24 am
R61BAUUP02	1.6	9:25	113.5 ft	10:03 am

MAINTENANCE PERFORMED ON SITE*: N/A (N/A if none)

DEVIATION FROM PROCEDURE (IF ANY) OR EQUIPMENT PROBLEMS OR FAILURES* (N/A if none)
* Offset at start should be 3.11, but 1.61 was entered.
"Down" log should be shifted +1.5 ft and "up" log should be shifted +1.53 ft.

DATA STORED IN TWO PLACES BEFORE DEPARTURE? ☐ YES. DESCRIBE: CD USB DRIVE
OTHER _____

*ITEMS WITH * MUST BE COMPLETED. OTHER INFORMATION IS OPTIONAL*

GEOVision
geophysical services

R-6-1b
Borehole*

CALIPER FIELD LOG

Procedure ASTM D6167-11 Borehole Caliper
Procedure ASTM D6274-10 Borehole Gamma

SITE*: Turkey Point NPP DATE*: 10/15/2013, 10/16/2013
CLIENT*: Paul C. Rizzo Associates, Inc. JOB*:13331
AUTHOR*: C. Carter PAGE: 1 OF 2

CONTACT: PHONE: Off Cell

CONTACT: PHONE: Off Cell

CONTACT: PHONE: Off Cell

DRILLER PHONE: Off Cell
COMPANY:

GENERAL SITE CONDITIONS/LOCATION:

COUNTY: RANGE: TOWNSHIP: SECTION:
BOREHOLE CONSTRUCTION: CASED UNCASED X
DIAMETERS AND DEPTH RANGES: 5 3/4" 0 TO 110 ft ; 5", 110 TO 464 ft

BOREHOLE TOTAL DEPTH AS DRILLED*: 464 ft

SURFACE CASING?: YES X 10/15 DEPTH TO BOTTOM OF CASING 110 ft ; NO X 10/16
DEPTH TO BEDROCK: ~5 ft DEPTH TO WATER TABLE: 0 ft
BOREHOLE FLUID: WATER ; FRESH WATER MUD X ; SALT WATER MUD
OTHER:
DEPTH TO BOREHOLE FLUID: <10 ft TIME SINCE LAST CIRCULATION: 7:30 am

LOGGING CREW: C. Carter
VEHICLE(S) USED AND MILEAGE:
MOBILIZED FROM: Florida City DEPARTURE TIME: 6:30
ARRIVED ON SITE: 7:00 am
STANDBY TIME: N/A CAUSE:

*ITEMS WITH * MUST BE COMPLETED. OTHER INFORMATION IS OPTIONAL*

GEOVision
geophysical services

R-6-1b
Borehole*

CALIPER FIELD LOG

Procedure ASTM D6167-11 Borehole Caliper
Procedure ASTM D6274-10 Borehole Gamma

SITE*: Turkey Point NPP
CLIENT*: Paul C. Rizzo Associates, Inc.
AUTHOR*: C. Carter

DATE*: 10/15/2013, 10/16/2013
JOB*:13331
PAGE: PAGE 2 OF 2

WINCH ARIES ☐ SILVER ☒ OYO ☐ RG ☐ OTHER
MICROLOGGER* 8083 ☐ 5772 ☒ OTHER
CALIPER PROBE* 5368 ☒ 6621 ☐ OTHER
SHEAVE* OYO 101 ☐ 102 ☐ 103 ☐ 104 ☐ Other RG ☒

PROBE OFFSET	2.08M(6.82 FT)		12 IN MAX
MINUS CASING STICK-UP*	1.61	1.61	REF TO GROUND SURFACE
DEPTH REF. OFFSET AT START*	5.21	5.21	
DEPTH REF. OFFSET AT END*	3.95	5.20	
AFTER SURVEY DEPTH ERROR*	1.26	0.01	

LOG NAME*	START DEPTH*	START TIME*	END DEPTH*	END TIME*	
R61BCALTEST01	N/A	8:39	N/A	8:40am	10/15
R61BCALUP01	455.7	9:15	99.65 ft	9:45am	
R61BCALTEST02	N/A	10:02	N/A	10:04am	
R61BCALTEST03	N/A	11:24	N/A	11:26am	10/16
R61BCALUP02	116.7	11:37	3.35 ft	11:48 am	
R61BCALTEST04	N/A	11:55	N/A	11:56am	

CALIBRATION PLATE S/N 201

		AS BUILT			PVC FITTING
		1.97 IN (50 MM)	3.94 IN (100 MM)	7.87 IN (200.0 MM)	4.50 IN (114. MM)
	FILE NAME				
AS MEAS.*	R61BCALTEST01	1.94	3.93	7.85	4.47
AS MEAS.*	R61BCALTEST02	1.95	3.91	7.84	4.49
AS MEAS.	R61BCALTEST03	1.95	3.91	7.84	4.48
AS MEAS.	R61BCALTEST04	1.93	3.91	7.83	4.47
AS MEAS.					
AS MEAS.					

MAINTENANCE PERFORMED ON SITE*: N/A (N/A if none)

EQUIPMENT PROBLEMS OR FAILURES*: N/A (N/A if none)

SUGGESTIONS, ADDITIONS, CHANGES:

*ITEMS WITH * MUST BE COMPLETED. OTHER INFORMATION IS OPTIONAL*

GEOVision
geophysical services

R-7-1 BORING GEOPHYSICS FIELD LOG SUMMARY

Borehole*

SITE*: Turkey Point NPP DATE*: 10/15, 16/2013
CLIENT*: Paul C. Rizzo Associates, Inc. JOB*: 13331
AUTHOR*: C. Carter PAGE*: 1 OF 1

CONTACT: Rolando J. Benitez PHONE: (412) 607-3560

BOREHOLE CONSTRUCTION: CASED ____ UNCASED X
DIAMETERS AND DEPTH RANGES: 5" 0 TO 190 ; 3 7/8", 190 TO 455 ft
BOREHOLE TOTAL DEPTH AS DRILLED*: 455 ft
SURFACE CASING?: YES X DEPTH TO BOTTOM OF CASING 190 ft ; NO X 10/16
DEPTH TO BEDROCK: ~5 ft
BOREHOLE FLUID: WATER____; FRESH WATER MUD X ; SALT WATER MUD ____;

LOGGING CREW: C. Carter

LOG TYPE*	FILE NAME*	DEPTH RANGE*	DATE*	TIMES*
Deviation	R71AUDOWN01	4.3-317.8 ft	10/15/2013	11:25 - 11:39 am
ATV	R71AUUP01	313.2-188.5 ft		11:40 - 12:09 pm
Deviation	R71AUDOWN02	252-454 ft		12:46 - 12:54 pm
Deviation	R71AUUP02	453.8-284.1 ft		12:54 - 1:07 pm
P-S velocity	R71SUSPDOWN01	58.5-134.5 m	10/15/2013	1:59 - 3:19 pm
Caliper	R71CALTEST01	N/A		4:02 - 4:04 pm
Cal -NG	R71CALUP01	450.25-179.9 ft		4:26 - 4:48 pm
Caliper	R71CALTEST02	N/A	10/15/2013	5:03 - 5:04 pm
Deviation	R71AUDOWN03	2.5-70.5 ft	10/16/2013	12:39 - 12:45 pm
Deviation	R71AUDOWN04	2.5-196.5 ft	10/16/2013	1:41 - 1:50 pm
ATV	R71AUUP03	196.5-2.4 ft	10/16/2013	1:52 - 2:51 pm
P-S velocity	R71SUSPDOWN02	2.0-57.0 m		3:15 - 4:22 pm
Caliper	R71CALTEST03	N/A		4:46 - 4:47 pm
Cal -NG	R71CALUP02	191.75-2.5 ft		5:00 - 5:16 pm
~~Caliper~~				
Caliper	R71CALTEST04	N/A	10/16/2013	5:23 - 5:24 pm

CL 10/16/13

ITEMS WITH * MUST BE COMPLETED. OTHER INFORMATION IS OPTIONAL

GEOVision
geophysical services

R-7-1
Borehole*

ACOUSTIC TELEVIEWER FIELD LOG

Procedure ASTM D5753-10 Borehole Geophysical
GEOVision HI-RAT Field Procedure Rev 2.00a

SITE*: Turkey Point NPP
DATE*: 10/15/2013
CLIENT*: Paul C. Rizzo Associates, Inc.
JOB*:13331
AUTHOR*: C. Carter
PAGE: 1 OF 2
REVIEWER: _____ (post field work)

CONTACT: _____ PHONE: Off Cell

CONTACT: _____ PHONE: Off Cell

DRILLER _____ PHONE: Off Cell
COMPANY: _____

GENERAL SITE CONDITIONS/LOCATION: _____

COUNTY: _____ RANGE: _____ TOWNSHIP: _____ SECTION: _____
BOREHOLE CONSTRUCTION: CASED ____ UNCASED X
DIAMETERS AND DEPTH RANGES: 5" 0 TO 190 ft ; 3 1/8", 190 TO 455 ft

BOREHOLE TOTAL DEPTH AS DRILLED*: 455 ft

SURFACE CASING?: YES X DEPTH TO BOTTOM OF CASING 190 ft ; NO
DEPTH TO BEDROCK: 5 ft DEPTH TO WATER TABLE: Ø
BOREHOLE FLUID: WATER ____; FRESH WATER MUD X ; SALT WATER MUD
OTHER:
DEPTH TO BOREHOLE FLUID: Ø TIME SINCE LAST CIRCULATION: 11 am

LOGGING CREW: C. Carter
VEHICLE(S) USED AND MILEAGE:
MOBILIZED FROM: Florida City DEPARTURE TIME: 6:30
ARRIVED ON SITE: 7:00
STANDBY TIME: N/A CAUSE:

*ITEMS WITH * MUST BE COMPLETED. OTHER INFORMATION IS OPTIONAL*

GEOVision
geophysical services

ACOUSTIC TELEVIEWER FIELD LOG

R-7-1
Borehole*

Procedure ASTM D5753-10 Borehole Geophysical
GEOVision HI-RAT Field Procedure Rev 2.00a

SITE*: Turkey Point NPP
DATE*: 10/15/2013
CLIENT*: Paul C. Rizzo Associates, Inc.
JOB*: 13331
AUTHOR*: C. Carter
PAGE: 2 OF 2
REVIEWER: _____ (post field work)

WINCH ARIES ☐ SILVER ☒ OYO ☐ RG ☐ OTHER _____
MICROLOGGER* 8083 ☐ 5772 ☒ OTHER _____
TELEVIEWER* CL 10/15/13 5174 ☒ 6641 ☒ OTHER _____
SHEAVE* OYO 101 ☐ 102 ☐ 103 ☐ 104 ☐ Other _____ RG ☒

All GEOVision Televiewer probes are made by Robertson Geologging, Ltd. of Deganwy, Conwy, UK

PROBE TILT TEST* 91.66 BRUNTON TILT* 92 +/-2°
PROBE TILT TEST* ~~92~~ 27.77 BRUNTON TILT* 28 +/-2°
CL 10/15/13 PROBE TILT TEST* ~~27~~ 43.97 BRUNTON TILT* 44 AFTER LOG* yes
PROBE AZIMUTH TEST* 140.80 BRUNTON AZIMUTH* 145 +/-10°
PROBE AZIMUTH TEST* 259.80 BRUNTON AZIMUTH* 252 +/-10°
PROBE AZIMUTH TEST* 174.40 BRUNTON AZIMUTH* 175 AFTER LOG* yes

PROBE OFFSET*	1.44M(4.72FT)		
MINUS CASING STICK-UP*	1.33	1.33	REF TO GROUND SURFACE
DEPTH REF. OFFSET AT START*	3.39	3.39	REF TO GROUND SURFACE
DEPTH REF. OFFSET AT END*	2.46	3.16	REF TO GROUND SURFACE
AFTER SURVEY DEPTH ERROR*	0.93	0.23	allow +/-0.4% of total depth

LOG NAME*	START DEPTH*	START TIME	END DEPTH *	END TIME
R7IAUDOWN01	4.3 ft	11:25	317.8 ft	11:39
R7IAUUP01	313.2	11:40	188.5 ft	12:09
R7IAUDOWN02	252	12:46	454 ft	12:54
R7IAUUP02	453.8	12:54	284.1 ft	1:07pm

MAINTENANCE PERFORMED ON SITE*: N/A (N/A if none)

DEVIATION FROM PROCEDURE (IF ANY) OR EQUIPMENT PROBLEMS OR FAILURES* (N/A if none)
Removed centralizers after getting hung up @ 313 ft. Ran deviation log instead of ATV.

DATA STORED IN TWO PLACES BEFORE DEPARTURE? ☐ YES. DESCRIBE: CD USB DRIVE OTHER _____

*ITEMS WITH * MUST BE COMPLETED. OTHER INFORMATION IS OPTIONAL*

GEOVision geophysical services

R-7-1 Borehole

P-S SUSPENSION VELOCITY FIELD LOG REV 1.5

CORRESPONDING P-S SUSPENSION PROCEDURE REV 1.5

SITE*: Turkey Point NPP DATE*: 10/15/2013, 10/16/2013

CLIENT*: Paul C. Rizzo Associates, Inc. JOB*: 13331

AUTHOR*: C. Carter PAGE 1 OF * 9

CONTACT: _____ PHONE: Off Cell _____

CONTACT: _____ PHONE: Off Cell _____

CONTACT: _____ PHONE: Off Cell _____

CONTACT: _____ PHONE: Off Cell _____

DIRECTIONS TO SITE: _____

GENERAL SITE CONDITIONS/LOCATION: _____

COUNTY: _____ RANGE: _____ TOWNSHIP: _____ SECTION: _____

BOREHOLE CONSTRUCTION*: CASED _____ UNCASED X

DIAMETERS AND DEPTH RANGES*: 5" 0 TO 190 ft ; 3 7/8", 190 TO 455 ft

BOREHOLE TOTAL DEPTH AS DRILLED*: 455 ft

SURFACE CASING?: yes DEPTH TO BOTTOM OF CASING 190 ft; NO x 10/16

DEPTH TO BEDROCK: 5 ft DEPTH TO WATER TABLE: Ø

BOREHOLE FLUID: WATER____; FRESH WATER MUD X; SALT WATER MUD; _____

OTHER: _____

DEPTH TO BOREHOLE FLUID*: Ø TIME SINCE LAST CIRCULATION: 11am, 1:15pm 10/16

*ITEMS WITH * MUST BE COMPLETED. OTHER INFORMATION IS OPTIONAL*

P-S FIELD LOG REV V1.5

GEOVision geophysical services

R-7-1 Borehole

P-S SUSPENSION VELOCITY FIELD LOG REV 1.5

CORRESPONDING P-S SUSPENSION PROCEDURE REV 1.5

SITE*: Turkey Point NPP DATE*: 10/15/2013
CLIENT*: Paul C. Rizzo Associates, Inc. JOB*: 13331
AUTHOR*: C. Carter PAGE 2 OF * 9

LOGGING CREW*: C. Carter
MOBILIZED FROM: Florida City DEPARTURE TIME: 6:30
ARRIVED ON SITE: 7:00
STANDBY TIME: CAUSE:
LOGGING STARTED: LOGGING COMPLETED:

BATTERIES CHANGED BEFORE LOGGING: YES ; NO x ; STORED WITH NEW
WINCH COMPROBE ☐ GREY ☒ OYO ☐ RG ☐ OTH

CALIBRATED INSTRUMENT*	RG LOGGER/RECORDER		OYO LOGGER/RECORDER		
	160023 ☐	160024 ☒	12004 ☐	15014 ☐	19029 ☐

MICROLOGGER* 8083 ☐ 5772 ☒ NO MICROLOGGER (OYO) ☐
RECEIVER S/N* 12008 ☐ 20042 ☐ 26066 ☐ 11001 ☐ 23053 ☐ 30086 ☒
ISOLATION TUBE S/N* 300083 ☐ 24053 ☒ 28068 ☐ 28072 ☐ 2M
SHEAVE* COMPROBE ☐ OYO 101 ☐ 102 ☐ 103 ☐ RG ☒
PROBE OFFSET* OYO 2.0M ☐ RG 2.5M ☒

MINUS CASING STICK-UP*	0.41	0.41	REF TO GROUND SURFACE
DEPTH REF. OFFSET AT START*	2.09	2.09	
DEPTH REF. OFFSET AT END*	~~2.98~~	2.03	
AFTER SURVEY DEPTH ERROR*	0.11	0.06	

CC 10/15/13

LOG NAME*	START DEPTH*	START TIME	END DEPTH *	END TIME
R71SUSPDOWN01	58.5m	1:59	134.5m	3:19pm
R71SUSPDOWN02	2.0m	3:15	57.0m	4:22pm

MAINTENANCE PERFORMED ON SITE*: N/A (N/A if none)

EQUIPMENT PROBLEMS OR FAILURES*: N/A (N/A if none)

DEVIATIONS FROM TEST PLAN*: On 10/16 hole caved in and could not log to 58.5m (N/A if none)

*ITEMS WITH * MUST BE COMPLETED. OTHER INFORMATION IS OPTIONAL*

P-S FIELD LOG REV 1.5

R-7-1

GEOVISION SUSPENSION LOGGING FIELD NOTES

SITE*: Turkey Point NPP

DATE*: 10/16/2013

CLIENT*: Paul C. Rizzo Associates, Inc.

JOB*: 13331

AUTHOR*: C. Carter

PAGE* 3 OF 9

*ITEMS WITH * MUST BE COMPLETED. OTHER INFORMATION IS OPTIONAL*

DEPTH METERS	DEPTH FEET	UNFILTERED FILE NO*.	FILTERED FILE NO*. (if any)	COMMENTS CASING, WATER, ROCK, ETC
0.5	1.64			
1.0	3.28			
1.5	4.92			
2.0	6.56	154		3:15
2.5	8.20	155		
3.0	9.84	156		
3.5	11.48	157		
4.0	13.12	158		
4.5	14.76	159		
5.0	16.40	160		
5.5	18.04	161		
6.0	19.69	162		
6.5	21.33	163		
7.0	22.97	164		
7.5	24.61	165		
8.0	26.25	166		
8.5	27.89	167		
9.0	29.53	168		
9.5	31.17	169		
10.0	32.81	170		
10.5	34.45	171		
11.0	36.09	172		
11.5	37.73	173		
12.0	39.37	174		
12.5	41.01	175		
13.0	42.65	176		
13.5	44.29	177		
14.0	45.93	178		
14.5	47.57	179		
15.0	49.21	180		
15.5	50.85	181		
16.0	52.49	182		
16.5	54.13	183		
17.0	55.77	184		
17.5	57.41	185		
18.0	59.06	186		
18.5	60.70	187		
19.0	62.34	188 189		
19.5	63.98	190		
20.0	65.62	191		

R-7-1

GEOVISION SUSPENSION LOGGING FIELD NOTES

SITE*: Turkey Point NPP DATE*: 10/16/2013
CLIENT*: Paul C. Rizzo Associates, Inc. JOB*: 13331
AUTHOR*: C. Carter PAGE* 4 OF 9

*ITEMS WITH * MUST BE COMPLETED. OTHER INFORMATION IS OPTIONAL*

DEPTH METERS	DEPTH FEET	UNFILTERED FILE NO*.	FILTERED FILE NO*. (if any)	COMMENTS CASING, WATER, ROCK, ETC
20.5	67.26	192		
21.0	68.90	193		
21.5	70.54	194		
22.0	72.18	195		
22.5	73.82	196		
23.0	75.46	197		
23.5	77.10	198		
24.0	78.74	199		
24.5	80.38	200		
25.0	82.02	201		
25.5	83.66	202		
26.0	85.30	203		
26.5	86.94	204		
27.0	88.58	205		
27.5	90.22	206		
28.0	91.86	207		
28.5	93.50	208		
29.0	95.14	209		
29.5	96.78	210		
30.0	98.43	211		
30.5	100.07	212		
31.0	101.71	213		
31.5	103.35	214		
32.0	104.99	215		
32.5	106.63	216		
33.0	108.27	217		
33.5	109.91	218		
34.0	111.55	219		
34.5	113.19	220		
35.0	114.83	221		
35.5	116.47	222		
36.0	118.11	223		
36.5	119.75	224		
37.0	121.39	225		
37.5	123.03	226		
38.0	124.67	227		
38.5	126.31	228		
39.0	127.95	229		
39.5	129.59	230		
40.0	131.23	231		

P-S FIELD LOG REV 1.5

R-7-1

GEOVISION SUSPENSION LOGGING FIELD NOTES

SITE*: Turkey Point NPP

DATE*: 10/15/2013, 10/16/2013

CLIENT*: Paul C. Rizzo Associates, Inc.

JOB*: 13331

AUTHOR*: C. Carter

PAGE* 5 OF 9

*ITEMS WITH * MUST BE COMPLETED. OTHER INFORMATION IS OPTIONAL*

DEPTH METERS	DEPTH FEET	UNFILTERED FILE NO*.	FILTERED FILE NO*. (if any)	COMMENTS CASING, WATER, ROCK, ETC
40.5	132.87	232		
41.0	134.51	233		
41.5	136.15	234		
42.0	137.80	235		
42.5	139.44	236		
43.0	141.08	237		
43.5	142.72	238		
44.0	144.36	239		
44.5	146.00	240		
45.0	147.64	241		
45.5	149.28	242		
46.0	150.92	243		
46.5	152.56	244		
47.0	154.20	245		
47.5	155.84	246		
48.0	157.48	247		
48.5	159.12	248		
49.0	160.76	249		
49.5	162.40	250		
50.0	164.04	251		
50.5	165.68	252		
51.0	167.32	253		
51.5	168.96	254		
52.0	170.60	255		
52.5	172.24	256		
53.0	173.88	257		
53.5	175.52	258		
54.0	177.17	259		
54.5	178.81	260		
55.0	180.45	261		
55.5	182.09	262		
56.0	183.73	263		
56.5	185.37	264		
57.0	187.01	265		4:22
57.5	188.65			hit @ 57.2 4:21 10/16
58.0	190.29			
58.5	191.93	001		1:59pm 10/15
59.0	193.57	2		
59.5	195.21	3		
60.0	196.85	4		

P-S FIELD LOG REV 1.5

R-7-1

GEOVISION SUSPENSION LOGGING FIELD NOTES

SITE*: Turkey Point NPP

DATE*: 10/15/2013

CLIENT*: Paul C. Rizzo Associates, Inc.

JOB*: 13331

AUTHOR*: C. Carter

PAGE* 6 OF 9

*ITEMS WITH * MUST BE COMPLETED. OTHER INFORMATION IS OPTIONAL*

DEPTH METERS	DEPTH FEET	UNFILTERED FILE NO*.	FILTERED FILE NO*. (if any)	COMMENTS CASING, WATER, ROCK, ETC
60.5	198.49	5		
61.0	200.13	6		
61.5	201.77	7		
62.0	203.41	8		
62.5	205.05	9		
63.0	206.69	10		
63.5	208.33	11		
64.0	209.97	12		
64.5	211.61	13		
65.0	213.25	14		
65.5	214.90	15		
66.0	216.54	16		
66.5	218.18	17		
67.0	219.82	18		
67.5	221.46	19		
68.0	223.10	20		
68.5	224.74	21		
69.0	226.38	22		
69.5	228.02	23		
70.0	229.66	24		
70.5	231.30	25		
71.0	232.94	26		
71.5	234.58	27		
72.0	236.22	28		
72.5	237.86	29		
73.0	239.50	30		
73.5	241.14	31		
74.0	242.78	32		
74.5	244.42	33		
75.0	246.06	34		
75.5	247.70	35		
76.0	249.34	36		
76.5	250.98	37		
77.0	252.62	38		
77.5	254.27	39		
78.0	255.91	40		
78.5	257.55	41		
79.0	259.19	42		
79.5	260.83	43		
80.0	262.47	44		

P-S FIELD LOG REV 1.5

R-7-1

GEOVISION SUSPENSION LOGGING FIELD NOTES

SITE*: Turkey Point NPP

DATE*: 10/15/2013

CLIENT*: Paul C. Rizzo Associates, Inc.

JOB*: 13331

AUTHOR*: C. Carter

PAGE* 7 OF 9

*ITEMS WITH * MUST BE COMPLETED. OTHER INFORMATION IS OPTIONAL*

DEPTH METERS	DEPTH FEET	UNFILTERED FILE NO*.	FILTERED FILE NO*. (if any)	COMMENTS CASING, WATER, ROCK, ETC
80.5	264.11	45		
81.0	265.75	46		
81.5	267.39	47		
82.0	269.03	48		
82.5	270.67	49		
83.0	272.31	50		
83.5	273.95	51		
84.0	275.59	52		
84.5	277.23	53		
85.0	278.87	54		
85.5	280.51	55		
86.0	282.15	56		
86.5	283.79	57		
87.0	285.43	58		
87.5	287.07	59		
88.0	288.71	60		
88.5	290.35	61		
89.0	291.99	62		
89.5	293.64	63		
90.0	295.28	64		
90.5	296.92	65		
91.0	298.56	66		
91.5	300.20	67		
92.0	301.84	68		
92.5	303.48	69		
93.0	305.12	70		
93.5	306.76	71		
94.0	308.40	72		
94.5	310.04	73		
95.0	311.68	74		
95.5	313.32	75		
96.0	314.96	76		
96.5	316.60	77		
97.0	318.24	78		
97.5	319.88	79		
98.0	321.52	80		
98.5	323.16	81		
99.0	324.80	82		
99.5	326.44	83		
100.0	328.08	84		

P-S FIELD LOG REV 1.5

R-7-1

GEOVISION SUSPENSION LOGGING FIELD NOTES

SITE*: Turkey Point NPP

DATE*: 10/15/2013

CLIENT*: Paul C. Rizzo Associates, Inc.

JOB*: 13331

AUTHOR*: C. Carter

PAGE* 8 OF 9

*ITEMS WITH * MUST BE COMPLETED. OTHER INFORMATION IS OPTIONAL*

DEPTH METERS	DEPTH FEET	UNFILTERED FILE NO*.	FILTERED FILE NO*. (if any)	COMMENTS CASING, WATER, ROCK, ETC
100.5	329.72	85		
101.0	331.36	86		
101.5	333.01	87		
102.0	334.65	88		
102.5	336.29	89		
103.0	337.93	90		
103.5	339.57	91		
104.0	341.21	92		
104.5	342.85	93		
105.0	344.49	94		
105.5	346.13	95		
106.0	347.77	96		
106.5	349.41	97		
107.0	351.05	98		
107.5	352.69	99		
108.0	354.33	100		
108.5	355.97	101		
109.0	357.61	102		
109.5	359.25	103		
110.0	360.89	104		
110.5	362.53	105		
111.0	364.17	106		
111.5	365.81	107		
112.0	367.45	108		
112.5	369.09	109		
113.0	370.73	110		
113.5	372.38	111		
114.0	374.02	112		
114.5	375.66	113		
115.0	377.30	114		
115.5	378.94	115		
116.0	380.58	116		
116.5	382.22	117		
117.0	383.86	118		
117.5	385.50	119		
118.0	387.14	120		
118.5	388.78	121		
119.0	390.42	122		
119.5	392.06	123		
120.0	393.70	124		

P-S FIELD LOG REV 1.5

R-7-1

GEOVISION SUSPENSION LOGGING FIELD NOTES

SITE*: Turkey Point NPP

DATE*: 10/15/2013

CLIENT*: Paul C. Rizzo Associates, Inc.

JOB*: 13331

AUTHOR*: C. Carter

PAGE* 9 OF 9

*ITEMS WITH * MUST BE COMPLETED. OTHER INFORMATION IS OPTIONAL*

DEPTH METERS	DEPTH FEET	UNFILTERED FILE NO*.	FILTERED FILE NO*. (if any)	COMMENTS CASING, WATER, ROCK, ETC
120.5	395.34	125		
121.0	396.98	126		
121.5	398.62	127		
122.0	400.26	128		
122.5	401.90	129		
123.0	403.54	130		
123.5	405.18	131		
124.0	406.82	132		
124.5	408.46	133		
125.0	410.10	134		
125.5	411.75	135		
126.0	413.39	136		
126.5	415.03	137		
127.0	416.67	138		
127.5	418.31	139		
128.0	419.95	140		
128.5	421.59	141		
129.0	423.23	142		
129.5	424.87	143		
130.0	426.51	144		
130.5	428.15	145		
131.0	429.79	146		
131.5	431.43	147		
132.0	433.07	148		
132.5	434.71	149		
133.0	436.35	150		
133.5	437.99	151		
134.0	439.63	152		
134.5	441.27	153		hit @ 134.7 @ 3:49
135.0	442.91			
135.5	444.55			
136.0	446.19			
136.5	447.83			
137.0	449.48			
137.5	451.12			
138.0	452.76			
138.5	454.40			
139.0	456.04			
139.5	457.68			
140.0	459.32			

GEOVision
geophysical services

R-7-1
Borehole*

CALIPER FIELD LOG

Procedure ASTM D6167-11 Borehole Caliper
Procedure ASTM D6274-10 Borehole Gamma

SITE*: Turkey Point NPP DATE*: 10/15, 16/2013
CLIENT*: Paul C. Rizzo Associates, Inc. JOB*:13331
AUTHOR*: C. Carter PAGE: 1 OF 2

CONTACT: PHONE: Off Cell

CONTACT: PHONE: Off Cell

CONTACT: PHONE: Off Cell

DRILLER PHONE: Off Cell
COMPANY:

GENERAL SITE CONDITIONS/LOCATION:

COUNTY: RANGE: TOWNSHIP: SECTION:
BOREHOLE CONSTRUCTION: CASED UNCASED X
DIAMETERS AND DEPTH RANGES: 5" 0 TO 190 ft ; 3 7/8", 190 TO 455 ft

BOREHOLE TOTAL DEPTH AS DRILLED*: 455 ft

SURFACE CASING?: YES X DEPTH TO BOTTOM OF CASING 190 ft ; NO X 10/16
DEPTH TO BEDROCK: 5 ft DEPTH TO WATER TABLE: Ø
BOREHOLE FLUID: WATER ; FRESH WATER MUD X ; SALT WATER MUD
OTHER:
DEPTH TO BOREHOLE FLUID: 0 TIME SINCE LAST CIRCULATION: 11am, 1:15 10/16

LOGGING CREW: C. Carter
VEHICLE(S) USED AND MILEAGE:
MOBILIZED FROM: Florida City DEPARTURE TIME: 6:30
ARRIVED ON SITE: 7:00am
STANDBY TIME: N/A CAUSE:

*ITEMS WITH * MUST BE COMPLETED. OTHER INFORMATION IS OPTIONAL*

GEOVision
geophysical services

R-7-1
Borehole*

CALIPER FIELD LOG

Procedure ASTM D6167-11 Borehole Caliper
Procedure ASTM D6274-10 Borehole Gamma

SITE*: Turkey Point NPP
CLIENT*: Paul C. Rizzo Associates, Inc.
AUTHOR*: C. Carter

DATE*: 10/15, 16/2013
JOB*:13331
PAGE: PAGE 2 OF 2

WINCH ARIES ☐ SILVER ☑ OYO ☐ RG ☐ OTHER
MICROLOGGER* 8083 ☐ 5772 ☒ OTHER
CALIPER PROBE* 5368 ☑ 6621 ☐ OTHER
SHEAVE* OYO 101 ☐ 102 ☐ 103 ☐ 104 ☐ Other RG ☒

PROBE OFFSET	2.08M(6.82 FT)		12 IN MAX
MINUS CASING STICK-UP*	1.33	1.33	REF TO GROUND SURFACE
DEPTH REF. OFFSET AT START*	5.49	5.49	
DEPTH REF. OFFSET AT END*	5.35	5.40	
AFTER SURVEY DEPTH ERROR*	0.14	0.09	

LOG NAME*	START DEPTH*	START TIME*	END DEPTH*	END TIME*
R7ICALTEST01	N/A	4:02	N/A	4:04
R7ICALUP01	450.25	~~4:5~~ 4:26	179.9 ft	4:48
		cc 10/15/13		
R7ICALTEST02	N/A	5:03	N/A	5:04
R7ICALTEST03	N/A	4:46	N/A	4:47
R7ICALUP02	191.75	5:00	2.5 ft	5:16pm
R7ICALTEST04	N/A	5:23	N/A	5:24pm

CALIBRATION PLATE S/N 201

		AS BUILT			PVC FITTING
		1.97 IN	3.94 IN	7.87 IN	4.50 IN
	FILE NAME	(50 MM)	(100 MM)	(200.0 MM)	(114. MM)
AS MEAS.*	R7ICALTEST01	1.92	3.91	7.84	4.48
AS MEAS.*	R7ICALTEST02	1.93	3.91	7.85	4.49
AS MEAS.	R7ICALTEST03	1.94	3.91	7.84	4.48
AS MEAS.	R7ICALTEST04	1.95	3.92	7.86	4.50
AS MEAS.					
AS MEAS.					

MAINTENANCE PERFORMED ON SITE*: N/A (N/A if none)

EQUIPMENT PROBLEMS OR FAILURES*: N/A (N/A if none)

SUGGESTIONS, ADDITIONS, CHANGES:

*ITEMS WITH * MUST BE COMPLETED. OTHER INFORMATION IS OPTIONAL*

GEOVision
geophysical services

R-7-1
Borehole*

ACOUSTIC TELEVIEWER FIELD LOG

Procedure ASTM D5753-10 Borehole Geophysical
GEOVision HI-RAT Field Procedure Rev 2.00a

SITE*: Turkey Point NPP
DATE*: 10/16/2013
CLIENT*: Paul C. Rizzo Associates, Inc.
JOB*:13331
AUTHOR*: C. Carter
PAGE: 1 OF 2
REVIEWER: _____ (post field work)

CONTACT: _____ PHONE: Off Cell

CONTACT: _____ PHONE: Off Cell

DRILLER _____ PHONE: Off Cell
COMPANY: _____

GENERAL SITE CONDITIONS/LOCATION: _____

COUNTY: _____ RANGE: _____ TOWNSHIP: _____ SECTION: _____
BOREHOLE CONSTRUCTION: CASED ____ UNCASED X
DIAMETERS AND DEPTH RANGES: 5" 0 TO 190 ft ; 3 7/8", 190 TO 455 ft

BOREHOLE TOTAL DEPTH AS DRILLED*: 455 ft

SURFACE CASING?: YES ____ DEPTH TO BOTTOM OF CASING ____ ; NO X
DEPTH TO BEDROCK: ~5 ft DEPTH TO WATER TABLE: Ø
BOREHOLE FLUID: WATER ____ ; FRESH WATER MUD X ; SALT WATER MUD ____
OTHER: ____
DEPTH TO BOREHOLE FLUID: Ø TIME SINCE LAST CIRCULATION: 1:15 pm

LOGGING CREW: C. Carter
VEHICLE(S) USED AND MILEAGE: ____
MOBILIZED FROM: Florida City DEPARTURE TIME: 6:30
ARRIVED ON SITE: 7:00 am
STANDBY TIME: N/A CAUSE: ____

*ITEMS WITH * MUST BE COMPLETED. OTHER INFORMATION IS OPTIONAL*

GEOVision
geophysical services

ACOUSTIC TELEVIEWER FIELD LOG

R-7-1
Borehole*

Procedure ASTM D5753-10 Borehole Geophysical
GEOVision HI-RAT Field Procedure Rev 2.00a

SITE*: Turkey Point NPP
DATE*: 10/16/2013
CLIENT*: Paul C. Rizzo Associates, Inc.
JOB*: 13331
AUTHOR*: C. Carter
PAGE: 2 OF 2
REVIEWER: _____ (post field work)

WINCH ARIES ☐ SILVER ☒ OYO ☐ RG ☐ OTHER _____
MICROLOGGER* 8083 ☐ 5772 ☒ OTHER _____
TELEVIEWER* 5174 ☐ 6641 ☒ OTHER _____
SHEAVE* OYO 101 ☐ 102 ☐ 103 ☐ 104 ☐ Other _____ RG ☒

All GEOVision Televiewer probes are made by Robertson Geologging, Ltd. of Deganwy, Conwy, UK

PROBE TILT TEST* 61.97 BRUNTON TILT* 62 +/-2°
PROBE TILT TEST* 38.81 BRUNTON TILT* 38 +/-2°
PROBE TILT TEST* 63.48 BRUNTON TILT* 64 AFTER LOG* yes
PROBE AZIMUTH TEST* 266.00 BRUNTON AZIMUTH* 258 +/-10°
PROBE AZIMUTH TEST* 177.50 BRUNTON AZIMUTH* 177 +/-10°
PROBE AZIMUTH TEST* 214.90 BRUNTON AZIMUTH* 210 AFTER LOG* yes

PROBE OFFSET*	1.44M(4.72FT)		
MINUS CASING STICK-UP*	1.33	1.33	REF TO GROUND SURFACE
DEPTH REF. OFFSET AT START*	2.46	2.46	REF TO GROUND SURFACE
DEPTH REF. OFFSET AT END*	2.45	2.35	REF TO GROUND SURFACE
AFTER SURVEY DEPTH ERROR*	.01	.11	allow +/-0.4% of total depth

LOG NAME*	START DEPTH*	START TIME	END DEPTH *	END TIME
R7IAUDOWN03	2.5 ft	12:39	70.5 ft	12:45pm
R7IAUDOWN04	2.5	1:41	196.5 ft	1:50
R7IAUUP03	196.5	1:52	2.4 ft	2:51

MAINTENANCE PERFORMED ON SITE*: N/A (N/A if none)

DEVIATION FROM PROCEDURE (IF ANY) OR EQUIPMENT PROBLEMS OR FAILURES*: N/A (N/A if none)

DATA STORED IN TWO PLACES BEFORE DEPARTURE? ☐ YES. DESCRIBE: CD USB DRIVE
OTHER _____

*ITEMS WITH * MUST BE COMPLETED. OTHER INFORMATION IS OPTIONAL*

GEOVision
geophysical services

R-7-4 BORING GEOPHYSICS FIELD LOG SUMMARY

Borehole*

SITE*: Turkey Point NPP DATE*: 10/15/2013
CLIENT*: Paul C. Rizzo Associates, Inc. JOB*: 13331
AUTHOR*: C. Carter PAGE*: 1 OF 1

CONTACT: Rolando J. Benitez PHONE: (412) 607-3560

BOREHOLE CONSTRUCTION: CASED X UNCASED
DIAMETERS AND DEPTH RANGES: 2" PVC 0 TO 120 ft ; , TO
BOREHOLE TOTAL DEPTH AS DRILLED*: 120 ft
SURFACE CASING?: YES DEPTH TO BOTTOM OF CASING; NO X
DEPTH TO BEDROCK: ~5 ft
BOREHOLE FLUID: WATER X; FRESH WATER MUD; SALT WATER MUD ;

LOGGING CREW: C. Carter

LOG TYPE*	FILE NAME*	DEPTH RANGE*	DATE*	TIMES*
Deviation	R74DOWN01	4.0 - 122.0 ft	10/15/2013	5:43 - 5:48 pm
Deviation	R74UUP02	122.1 - 4.0 ft	10/15/2013	5:50 - 5:56 pm

*ITEMS WITH * MUST BE COMPLETED. OTHER INFORMATION IS OPTIONAL*

GEOVision
geophysical services

R-7-4
Borehole*

ACOUSTIC TELEVIEWER FIELD LOG

Procedure ASTM D5753-10 Borehole Geophysical
GEOVision HI-RAT Field Procedure Rev 2.00a

SITE*: Turkey Point NPP DATE*: 10/15/2013
CLIENT*: Paul C. Rizzo Associates, Inc. JOB*:13331
AUTHOR*: C. Carter PAGE: 1 OF 2
REVIEWER: _____ (post field work)

CONTACT: _____ PHONE: Off Cell

CONTACT: _____ PHONE: Off Cell

DRILLER _____ PHONE: Off Cell
COMPANY: _____

GENERAL SITE CONDITIONS/LOCATION: _____

COUNTY: _____ RANGE: _____ TOWNSHIP: _____ SECTION: _____
BOREHOLE CONSTRUCTION: CASED X UNCASED _____
DIAMETERS AND DEPTH RANGES: 2" PVC 0 TO 120 ft ; _____, _____ TO _____

BOREHOLE TOTAL DEPTH AS DRILLED*: 120 ft

SURFACE CASING?: YES ____ DEPTH TO BOTTOM OF CASING _____ ; NO X
DEPTH TO BEDROCK: ~5 ft DEPTH TO WATER TABLE: Ø
BOREHOLE FLUID: WATER ____ ; FRESH WATER MUD ____ ; SALT WATER MUD
OTHER: _____
DEPTH TO BOREHOLE FLUID: Ø TIME SINCE LAST CIRCULATION: N/A

LOGGING CREW: C. Carter
VEHICLE(S) USED AND MILEAGE: _____
MOBILIZED FROM: Florida City DEPARTURE TIME: 6:30
ARRIVED ON SITE: 7:00 am
STANDBY TIME: N/A CAUSE: _____

*ITEMS WITH * MUST BE COMPLETED. OTHER INFORMATION IS OPTIONAL*

GEOVision
geophysical services

ACOUSTIC TELEVIEWER FIELD LOG

R-7-4
Borehole*

Procedure ASTM D5753-10 Borehole Geophysical
GEOVision HI-RAT Field Procedure Rev 2.00a

SITE*: Turkey Point NPP
DATE*: 10/15/2013
CLIENT*: Paul C. Rizzo Associates, Inc.
JOB*: 13331
AUTHOR*: C. Carter
PAGE: 2 OF 2
REVIEWER: _____ (post field work)

WINCH ARIES ☐ SILVER ☒ OYO ☐ RG ☐ OTHER _____
MICROLOGGER* 8083 ☐ 5772 ☒ OTHER _____
TELEVIEWER* 5174 ☐ 6641 ☒ OTHER _____
SHEAVE* OYO 101 ☐ 102 ☐ 103 ☐ 104 ☐ Other _____ RG ☒

All GEOVision Televiewer probes are made by Robertson Geologging, Ltd. of Deganwy, Conwy, UK

PROBE TILT TEST* 90.06 BRUNTON TILT* 90 +/-2°
PROBE TILT TEST* 29.45 BRUNTON TILT* 29 +/-2°
PROBE TILT TEST* 61.22 BRUNTON TILT* 61 AFTER LOG* yes
PROBE AZIMUTH TEST* 123.40 BRUNTON AZIMUTH* 130 +/-10°
PROBE AZIMUTH TEST* 323.30 BRUNTON AZIMUTH* 318 +/-10°
PROBE AZIMUTH TEST* 112.60 BRUNTON AZIMUTH* 119 AFTER LOG* yes

PROBE OFFSET*	1.44M(4.72FT)	
MINUS CASING STICK-UP*	0.75	REF TO GROUND SURFACE
DEPTH REF. OFFSET AT START*	3.97	REF TO GROUND SURFACE
DEPTH REF. OFFSET AT END*	3.92	REF TO GROUND SURFACE
AFTER SURVEY DEPTH ERROR*	0.05	allow +/-0.4% of total depth

LOG NAME*	START DEPTH*	START TIME	END DEPTH *	END TIME
R74AUDOWN01	4.0	5:43	122.0 ft	5:48 pm
R74AUUP01	122.1	5:50	4.0 ft	5:56 pm

MAINTENANCE PERFORMED ON SITE*: N/A (N/A if none)

DEVIATION FROM PROCEDURE (IF ANY) OR EQUIPMENT PROBLEMS OR FAILURES* N/A (N/A if none)

DATA STORED IN TWO PLACES BEFORE DEPARTURE? ☐ YES. DESCRIBE: CD USB DRIVE
OTHER _____

*ITEMS WITH * MUST BE COMPLETED. OTHER INFORMATION IS OPTIONAL*

APPENDIX G

BORING GEOPHYSICAL LOGGING FIELD MEASUREMENT PROCEDURES

PROCEDURE FOR USING THE ROBERTSON GEOLOGGING HI-RESOLUTION ACOUSTIC TELEVIEWER (HiRAT)

Revision 2.0 Reviewed 11/18/11

Background

The acoustic televiewer is a device for producing a qualitative image of the wall of a borehole. Because it uses ultrasound rather than visible light it is able to work in dirty or opaque borehole fluids, although heavy drilling mud will cause excessive dispersion of the acoustic beam. The picture below shows the probes' cylindrical black plastic acoustic imaging window, and one of the bowspring attachments which are used to centralize the probe in the borehole.

Pulses of ultrasound (0.5 - 1.5MHz) are generated by a piezo-electric resonator. The pulses are transmitted through the oil in which the resonator is immersed, through the imaging window, then propagate through the borehole fluid and are reflected from the wall of the borehole. The reflected energy is picked up by the same transducer, from which is recorded both the ***amplitude*** of the returned pulse and the ***travel-time*** which have elapsed. Blanking must be applied to prevent the transducer from registering reflections from the inside surface of the imaging window. The material of the window is chosen so that its acoustic properties are similar to the oil which fills it. The window is not designed to withstand borehole fluid pressures, but has a piston device to allow equalization between inside and outside pressure.

The ***amplitude*** of the returned pulse is a function of the acoustic reflectivity of the borehole wall. If the beam strikes a hard borehole wall normally to the surface the energy will be returned to the transducer and a strong return will be recorded. If the formation is softer, then less energy will be reflected. Also, if the surface of the borehole is rough, or effectively missing because of the presence of a fracture or other structure, then energy will be dispersed and a low energy return will be recorded.

The ***travel-time*** is a simple function of the diameter of the borehole and the velocity of sound in the borehole fluid (nominally 1.5Km/sec). An A/D converter monitors the output from the transducer once the blanking period has expired and a comparator is used to detect the peak amplitude during the sampling period.

The coaxially-mounted transducer has a planar radiating surface, but the vibration characteristics are such that the acoustic pulse is emitted as a 'pencil' beam. The emitted beam is deflected by a planar mirror so that it leaves the acoustic imaging window at right angles to the probe axis. The mirror is rotated to scan the borehole wall. The ultrasound pulses are synchronized with rotation of the mirror so that up to 360 pulses are emitted in every revolution. Because of the time which must elapse for the two-way transit of the borehole fluid, there is an upper limit upon the number of radial samples that may be acquired from a borehole of a particular radius. In larger boreholes, therefore, it may be necessary to reduce the number of radial samples. The probe is able to operate at 90, 180 or 360 samples per revolution.

An image of the borehole wall is produced by moving the probe along the borehole axis while it is scanning radially. By the same logic as shown above, it can be seen that any horizontal point will be imaged by more than one sweep of the acoustic beam so long as the axial movement of the probe during one complete sweep is no greater than the beam diameter. Image resolution is therefore a function of the vertical logging speed, the rotational speed of the transducer, the radial sampling interval and borehole diameter.

Objective

The objective of this procedure is to map the orientation and dip angles of fractures, bedding planes and voids in rock boreholes, and provide a pseudo “core” of the borehole for comparison with rock cores obtained during drilling . It may also be used to obtain borehole deviation data without an image in soil or non-magnetic cased borings.

Instrumentation

This procedure is written specifically for the Robertson Geologging High-Resolution Acoustic Televiewer (HiRAT). The required equipment includes:

1. The Robertson High-Resolution Acoustic Televiewer (HiRAT) probe with centralizers.
2. A 4-conductor wire-line winch with cable at least 30m (100 feet) longer than the depth of the borehole.
3. A sheave with depth encoder with minimum 500 pulses per meter of cable travel. For example, a 400ppr encoder with a 400mm circumference sheave provides 1000 pulses per meter of cable travel.
4. A Robertson Geologging Micrologger II, or equivalent.
5. A laptop with Robertson Geologging HiRAT program, Version 11 or above, or equivalent, installed and the following minimum system requirements:
   - Windows XP or above
   - 256MB System memory
   - 800x600x24 SVGA Display with DirectX 8.0
   - 1.2Ghz CPU
   - USB 2.0 connection
6. 12 volt DC Battery power supply with cables.

Environmental Conditions

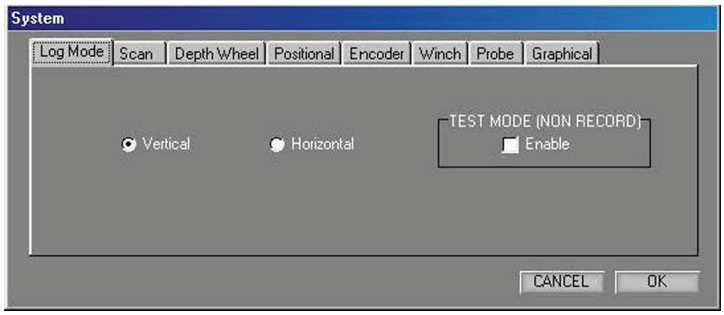
This tool is designed for fluid-filled boreholes between 67 and 150mm (3-6in) in rock. In some instances, highly reflective borehole walls may permit use at large diameters. Since fine fractures are usually not visible in the walls of soil borings, the HiRAT adds little more information from a soil boring than a simple video. If the boring has soil AND rock, HiRAT images in the soil may be useful.

HiRAT Field Procedure

Because the logging software is a standalone module, there are a number of settings which must be initialized in the HiRAT software. These include the depth measurement subsystem and probe operating modes. Click on 'System' on the menu bar to show the following dialog boxes:

1. Log Mode

The probe can operate in three distinct modes:



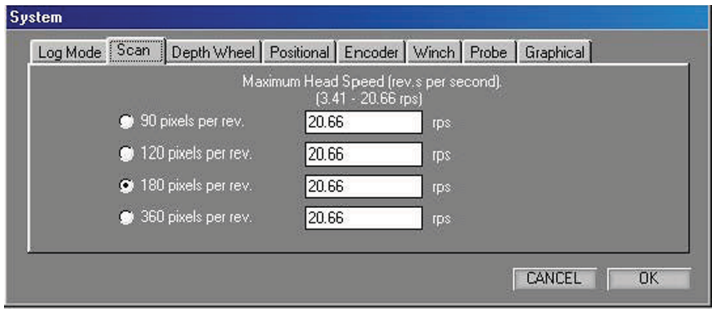
- Vertical mode is used for boreholes which are drilled from the surface and are deviated at less than 70 degrees from the vertical. Most exploration boreholes will fall into this class. In this mode the image is orientated according to compass directions (magnetic co-ordinates).

- Horizontal mode is used for boreholes which are sub-horizontal so their inclination will probably exceed 70 degrees from the vertical. Boreholes in this class would normally be drilled as part of ground investigations for tunneling and mining, drilling ahead of a drive to determine the nature and extent of fracturing. In this mode the image is orientated according to gravitational coordinates (up/down) since there is no unique point of the image circle which can be orientated to North with any precision.

- Test mode is used to exercise all probe functions without creating a log. The image will scroll on the screen in the normal fashion, and orientation readouts will be refreshed continuously.

2. Scan Parameters

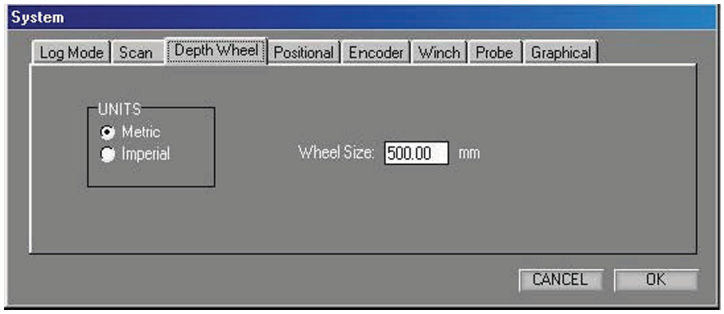
The scan parameters control the radial sampling of the borehole. The values will be retained between logging sessions, so the probe will be initialized correctly at power-on.



- The radial sampling rate can be set to one of 90, 120, 180, 360 samples per revolution. There is a relationship between the logging speed and the radial sampling rate, since the time taken to send the dataset to the surface depends upon its length. The size of the log file is also determined by the radial sampling rate. The probe will always try to use the maximum head speed entered. If limited by a low Baud rate or a large 'window' setting then the probe will reduce its head speed automatically to compensate - see probe operation section.

3. Depth Wheel Configuration

The depth measurement system is dependent upon the combination of depth measurement wheel with its specified circumference, and the shaft encoder which translates rotation into pulses which are counted by the logging system controller. Two parameters are therefore required: depth wheel circumference and encoder pulse rate per wheel revolution. The encoder parameters are covered in a subsequent topic.

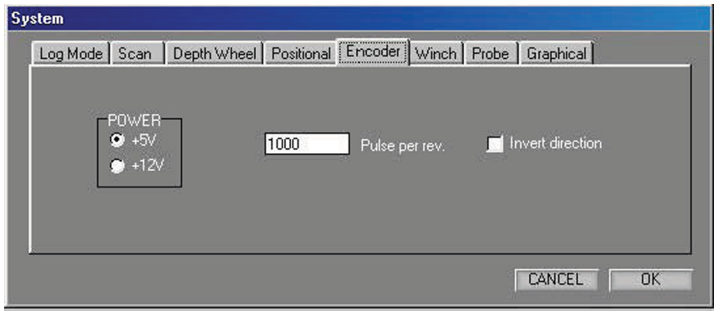


- Select Metric or Imperial depth measurement units from the left-hand pane.

- Type the circumference of the depth measurement wheel into the 'wheel size' box. The standard sizes of GEOVision wheels range from 400mm to 1000mm. If measuring in Imperial units (or changing back to metric units), the standard wheel size can be converted automatically by clicking the left mouse button and choosing the appropriate conversion. The size is always specified in units of 1/1000 of the depth unit i.e. millimeters (mm) or millifeet (mft).

4. Encoder Configuration

The depth measurement system is dependent upon the combination of depth measurement sheave and the shaft encoder which translates rotation into pulses which are counted by the logging system controller. The depth wheel circumference is covered in a previous topic. In order to accommodate a variety of encoders, their operational characteristics can be configured in the software.

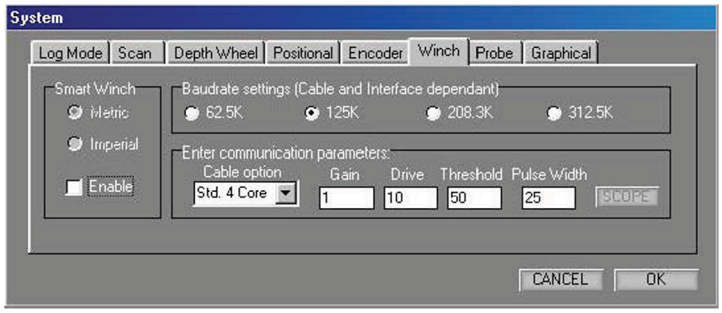


- Select supply voltage from the radio buttons in the left-hand pane. The options are 5 Volt and 12 Volt. GEOVision encoders are always specified for 5 Volt operation.

- Type the number of pulses emitted per revolution into the central box. This can be 400ppr to 5000ppr, depending on the encoder and wheel configuration.

- The logical direction of movement can be reversed if required to accommodate the mounting of the sheave.

5. Winch and Cable Configuration



The Baud settings can be chosen to match the *quality* of the communication channel. The channel will be effected by cable type and length. Typically a Baudrate of 312.5K is used. The remaining controls in the dialog relate to the communications parameters.

- ***Cable Option*** is used to select the logging cable type which is available on the winch. The options are *Not Connected*, *Std. 4 Core*, *Differential* and *Monocable*. The only cable types used in GEOVision systems is Std. 4 Core. Select the appropriate type from the drop-down menu box. Note this value can only be changed when the probe power is turned off.

- ***Gain*** is related to cable length and uphole signal attenuation. Gain values range from 0-3 and control the amplification applied to the incoming signal. Use the *Scope* dialog to visualize the incoming signals. Gain should be set so that the signal reaches between 50% and 100% of the height of the *Scope* display, generally obtained with a setting of 0 or 1 for GEOVision winches. If the peak height exceeds this level, clipping will result in artifacts which will be detected erroneously. Click *Apply* to set the parameters before proceeding to the *Scope* dialog.

- ***Threshold*** is the level at which the incoming signals are detected. Gain and Threshold are related, and can be visualized using the *Scope* dialog. Set the gain so that the signal reaches between 50% and 100% of the height of the display. Then adjust the threshold so that it is between 40% and 80% of the height of the pulses displayed and clear of any region of 'overshoot' of the positive and negative pulses. This will ensure that peaks are detected and noise is ignored. Generally a setting between 45 and 65 is used for GEOVision winches. When the scope dialog is displayed, the position of the mouse is reported as a threshold value to make it simpler to infer the correct setting. The scope option is grayed out when the probe power is turned off.

- ***Drive*** sets the strength of the downhole signal. It is not possible to visualize the downhole signal, but the effect of insufficient drive is to disable downhole communication, which will result in the commands being ignored by the probe. Values range from 0 -127, and for GEOVision winches will generally be between 3 and 20. Increase the drive for longer cables.

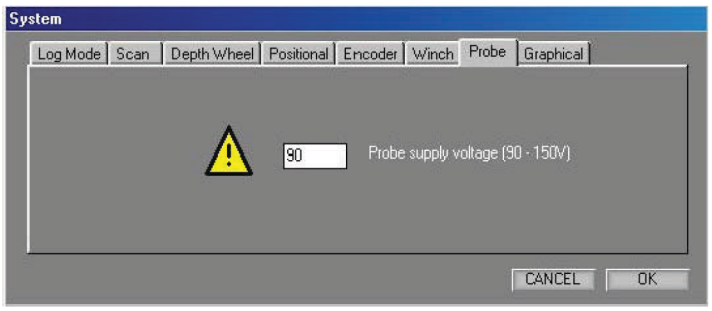
- ***Pulse Width*** This is the width of the transmitted communication pulses in 100nS steps. The default is 25 equivalent to 2.5uS. The range is from 8 to 64. The pulse width can be reduced to prevent signal overshoot on short cables. The default value is used in most cases. Note any changes only come into effect during a log. (Note setting too large a pulse width when using the highest Baud rates will automatically be prevented within the probe and the pulse width reduced.)

IMPORTANT Please note the effects of changing 'Baud' will not appear until the first new log is made. The setting for 'threshold' may be effected by an increase in the 'Baud' rate please recheck 'threshold' if 'Baud' is altered using the 'Scope' function after making a short test log.

The parameters which are entered will be applied automatically if you close the dialog with ***OK***. The above parameters once set correctly for a particular winch system will be remembered by the system and should not need to be altered.

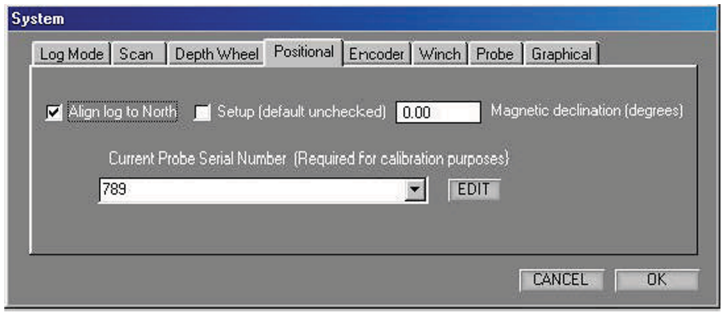
6. Probe Configuration

The probe is normally energized at 90 Volts from the surface. However, it may be necessary to compensate for voltage drop on longer cables due to the higher power draw of this probe. The voltage at the surface may be increased in order to deliver 90 Volts at the probe. Simply type the value into the text box provided. The voltage should be set at 90V for all GEOVision winches. Values outside the indicated range will be rejected.



7. Positional Configuration

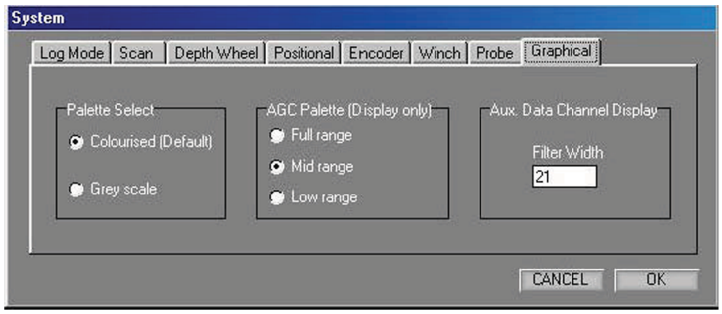
The probe includes a 3-axis orientation package, and is capable of producing a borehole image aligned to geographic North. This is achieved by determining and applying two image rotation parameters:



- ***Magnetic Declination*** is used to correct for the difference between Magnetic North and True North. The value varies from place to place, so the local value must be inserted here if you wish to perform this correction during data collection. GEOVision collects all data referred to Magnetic North, and makes this correction during processing. If the value is zero, the log will be referred to Magnetic North.
- ***Align to North*** is a check-box used to select image rotation to start at Magnetic North. If in addition a value is set for Magnetic Declination (see above) the image will be rotated to start at True North. If the box is not checked, the image will not be oriented to geographic co-ordinates, but will use the local co-ordinate frame of the probe (X, Y, Z axis of the orientation module). This mode may be used to inspect the inside of magnetic casing, where an orientated image would be subjected to random effects caused by the metalwork.

8. Graphical

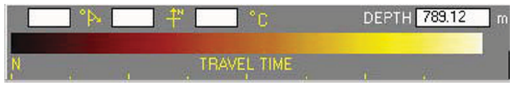
The palette can be changed between a colored and grey scale setting. The changes affect the log screen palette display and are also applied when replaying a log. Selecting Full range in the 'AGC Palette' will cause the software to spread the palette over the full 16bit signal. 'Mid range' will spread the palette over the first quarter of the 16bit range and 'Low range' will spread the palette over the first eighth of the 16 bit range. In most cases the 'Low range' selection is used. Note these settings do not affect the stored log data in any way. The 'Filter Width' is applied to the Natural Gamma trace data, if active, and is a simply running average filter. The range of the filter width is from 1 to 50 (x 10 millidepth units ie. mm or mft).



9. Probe Operation

When the operations specified above have been reviewed and the correct settings have been selected, the system is ready for use. The main screen area is divided into 3 horizontal elements. At the top is the depth and orientation readout, together with the scale headings for the scrolling display of unwrapped borehole image.

On the left side of the depth track is the travel time display, with text boxes for probe inclination, azimuth and head temperature.



On the right side is the display of amplitude and indication of current operating mode. Located in the center above the depth track are the text boxes for depth and cable speed (computed at the surface). The ranges for the 'Natural Gamma' channel overlay (optional) are shown above the Amplitude.

The central area is utilized for the scrolling display of unwrapped borehole data. The display is orientated

with the left edge corresponding to North point of the aligned image data (if orientation is selected) according to the outputs of the probe's orientation package.

Depth is initialized by typing the required value into the entry box and pressing Enter. The entry box is not available at times when the system is in logging mode and the depth should not be changed by user entry.

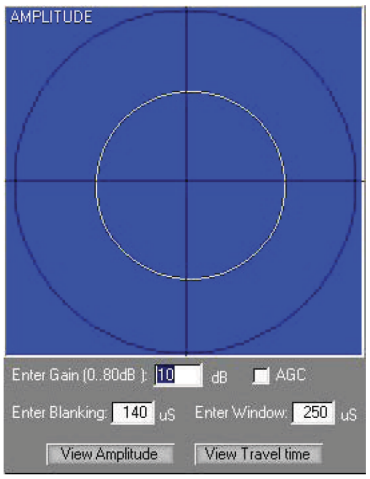
Probe power is applied by clicking on the green-colored 1 button. Power is turned off by clicking on the red-colored 0 button. There is no indicator for the state of the power supply on the desktop, so the external indicators should be observed for this purpose.

To make a log ensure that the Test Mode is disabled - see section 1, Log Mode setting. Click File|New Log and select a filename. Old logs may be overwritten if necessary -TAKE CARE. The header editor will be started automatically. A previous set of header data may be loaded by clicking LOAD and choosing a template.

To start logging, click on the red Record (circle) control. The log data will start to scroll down the screen after a brief pause for synchronization. The messages "DSP2: Detecting data stream" and "Updating probe settings" may be observed at the bottom of the screen during this process. Note that the screen scrolling direction is not affected by the actual direction of movement of the probe. To cease logging, click on the black STOP control (square). The data should be immediately backed up to a USB drive, CD, or other data storage prior to leaving the boring location.

If the data display from a probe which is properly connected appears to occupy only half of the track area, with the remainder filled with random colors such as green which are not part of the regular palette, then it is most likely that the downhole data communication is not functioning properly. This symptom is due to the fact that the probe settings cannot be communicated properly, and it is operating in its default power-up mode. If this is the case, the Drive setting of the System|Winch dialog should be increased or decreased accordingly.

.



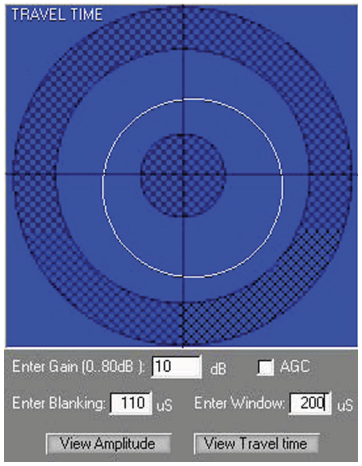
To adjust the probe gain it is necessary to use the Radial Amplitude plot, which is enabled by clicking on the circle with cross-hairs symbol. When the dialog is active a new window will open on top of the unwrapped data display. In this display, the data is presented as a 'polar' plot. Press the 'View Amplitude' button to display the amplitude plot. This plot shows amplitude increasing towards the outside of the circle and the compass direction following the sweep of the transducer. The line indicating the data is drawn in the regular palette, so that high amplitudes are drawn in white and low amplitudes in black/brown. The picture here shows the image of the inside of a cylinder.

If the data is concentrated in a small circle at the center, the gain is too low and should be increased. If the data is obviously clipped at the outside of the circle, then the gain should be reduced. Type the new gain value into the entry box and press Enter. The ideal would be to set a gain value which allows the peak values to be displayed without clipping, with the majority of the data around the half-way level. It may also be necessary to adjust the blanking to ensure that internal reflections from the acoustic window are not detected at the new gain value. This will be apparent in the unwrapped data display as pronounced patterning unrelated to the true target. The AGC option causes the probe to set gain automatically thus preventing signal saturation in most cases. (The gain is varied in 6dB steps)

Blanking Period and window length can be set independently. Blanking is set to avoid reflections from the window of the acoustic transducer or random reflections from a rough borehole wall, and window length is set to accommodate the range of borehole radii that might be expected. An error will be indicated if the sum of the blanking period and window length would be greater than 409 microseconds, which is the maximum range of the timer. The default value for the blanking period is 145 microseconds, which is the minimum required for the two-way transit from the transceiver to the outer surface of the acoustic window. It is not advisable to reduce this value beyond the default setting, although it may be increased for larger boreholes at the rate of 1.5mm of one-way travel per microsecond.

Window Length (sample time) defines the period during which the arrival gate remains open to detect the returned acoustic pulse. The acoustic pulse will travel in water at a speed of approximately 1.5mm per microsecond. The default window length is 150 microseconds, which is equivalent to 225 mm of (two-way) travel in the borehole fluid, or approximately 110mm of borehole diameter. If this is added to the default blanking period, which is equivalent to the outside diameter of the acoustic window, it can be seen that the default set-up will be correct for boreholes up to 150mm. An error will be indicated if the sum of the blanking period and window length would be greater than 409 microseconds, which is the maximum range of the timer. Choose the window setting to best match the borehole diameter and conditions.

Pressing the 'View Travel time' button changes the display to that shown below:



The unhatched ring between the two cross hatched zones represents the sample window. The width of this ring will vary with window length value. The profile of a cylinder is represented here appearing as a circle in the sample window. In this example, the circle is not concentric with the cross-hatched zones, indicating the probe is not centralized in the cylinder.

10. Field Standardization Checks

As stated in ASTM D5753, Section 7.1.1, National Institute of Standards and Technology (NIST) calibration and operating procedures do not exist for the borehole geophysical logging industry. However, geophysical logs can be used in a qualitative or quantitative manner, depending on project objectives. Calibration ensures standardization, but since calibration procedures do not exist for the acoustic televiewer, this procedure is written with standardization or validation objectives in mind.

According to ASTM D5753 standardization is the process of checking the log response to reveal evidence of repeatability and consistency. Standardization is needed to establish comparability between logs made with different equipment or at different times and to ensure the accuracy of measurements., Further, standardization checks should include at least two different measurement values approximating the range of interest. Finally, log response needs to be checked using field standards often enough to satisfy the project objectives. Standardization of the log response provides the basis for correcting for changes (for example, changes in output with time due to system drift or changes of equipment). In the specific case of an acoustic televiewer, the ASTM D5753 standard recommends that the oriented image-magnetometer must be checked. To meet these requirements, the following steps are incorporated into the field logging procedure:

1. Prior to insertion in the borehole, the probe is tilted at two different angles and the resulting readout is compared to a Brunton pocket transit (Brunton) inclinometer or equivalent and recorded in the field log. This verifies two different measurement values and functionality of the probe accelerometers. This functional test is repeated for one angle after logging. Tilt angle values should agree within +/-2 degrees.

2. Prior to insertion in the borehole, the probe is rotated through two different compass orientations and the resulting readout is compared to a Brunton pocket transit or equivalent and recorded in the field log. This verifies two different measurement values and functionality of the probe fluxgate compass. This functional test is repeated for one angle after logging. Azimuth values between the probe and the Brunton should agree within +/-10 degrees. NOTE: It is very difficult to achieve better accuracy than this in the field due to local magnetic field effects of drill rigs, vehicles, etc., and in some locations (near power lines, near pipe lines, near high rise buildings, in cities or at power plants) may be impossible. In these locations these tolerances must be relaxed to permit use of the probe.

3. The log is performed with the probe moving downward as well as upward. The downward log is generally performed at a lower vertical resolution and higher speed then the upward log. This allows closure of the deviation log, and repeat measurements as needed. After survey depth error should not exceed 0.4% of the total borehole depth, or 5 inches in 100 feet. Larger errors may be acceptable if the borehole cannot be reoccupied, or the cause of the error is identified as an obstruction during the descent of the probe. In this case depth reference may be corrected to the exit depth reference.

11. Required Field Records

1) Borehole identification

2) Date of test

3) Tester or data recorder

4) Description of probe reference point; (the “probe offset” on the log form)

5) Model and manufacturer of logging tools; (HRAT High Resolution Acoustic Televiewer made by Robertson Geologging, Ltd. of Deganwy, Conwy, UK)

6) Tool serial number;

7) Top and bottom of logged interval;

8) Logging speed (stored in data file header) and direction (in file name);

9) Vertical depth error after logging;

10) Time constant, time interval or depth interval of digital samples (stored in data file header)

11) Data must be stored in at least 2 places, such as the laptop hard disk and CDRom, or hard disk and USB flash drive, or uploaded to FTP, prior to leaving the site.

12) Identification of disk containing digitized logs; and all removable digital media, such as CDRoms or USB flash drives with backup copies of data on hard disk, must be “labeled” with job number, borehole designation, date, and tester name. For USB flash drives or hard disks on separate computers, the “label” can be a .txt file with this information, or a file directory which has the job number and borehole name.

13) Any deviations from test plan and action taken as a result

14) Any equipment problems or maintenance performed are recorded on the log form.

An example Field Log form is attached to this procedure.

Data Analysis and Interpretation

RG-DIP, the manufacturer's image interpretation package, as well as WellCAD (http://www.alt.lu/wellcad.htm) offer manual and automatic feature recognition options. Feature orientations (dip and azimuth) are automatically calculated. Display options include orthographic projection of borehole deviation, projection and tadpole presentation of identified features, stereonet analysis of feature orientation, feature frequency histograms and 'synthetic cores' for comparison with real core data. The last option is invaluable for orientating and locating core samples, particularly in the case of incomplete core recovery or core damage.

Reporting

The final report will include the objective and scope of the survey, location of the boreholes if available, discussion of instrumentation and procedures in the field. For each borehole that is imaged, there will be a plot showing the dip and azimuth of features. A following page shows an example.

Assumptions and limitations of the results will be discussed. Supporting references will be listed as necessary.

This procedure has been reviewed and approved by the undersigned:

Professional Geophysicist_____Date___Nov 18. 2011___

QA Review _____Date____Nov 18. 2011__

References:

1. Operating Manual for the HRAT High Resolution Acoustic Televiewer, by Robertson Geologging, Ltd., Deganwy, Conwy, UK
2. "Standard Guide for Planning and Conducting Borehole Geophysical Logging", ASTM Standard D5753-05, re-approved 2010.

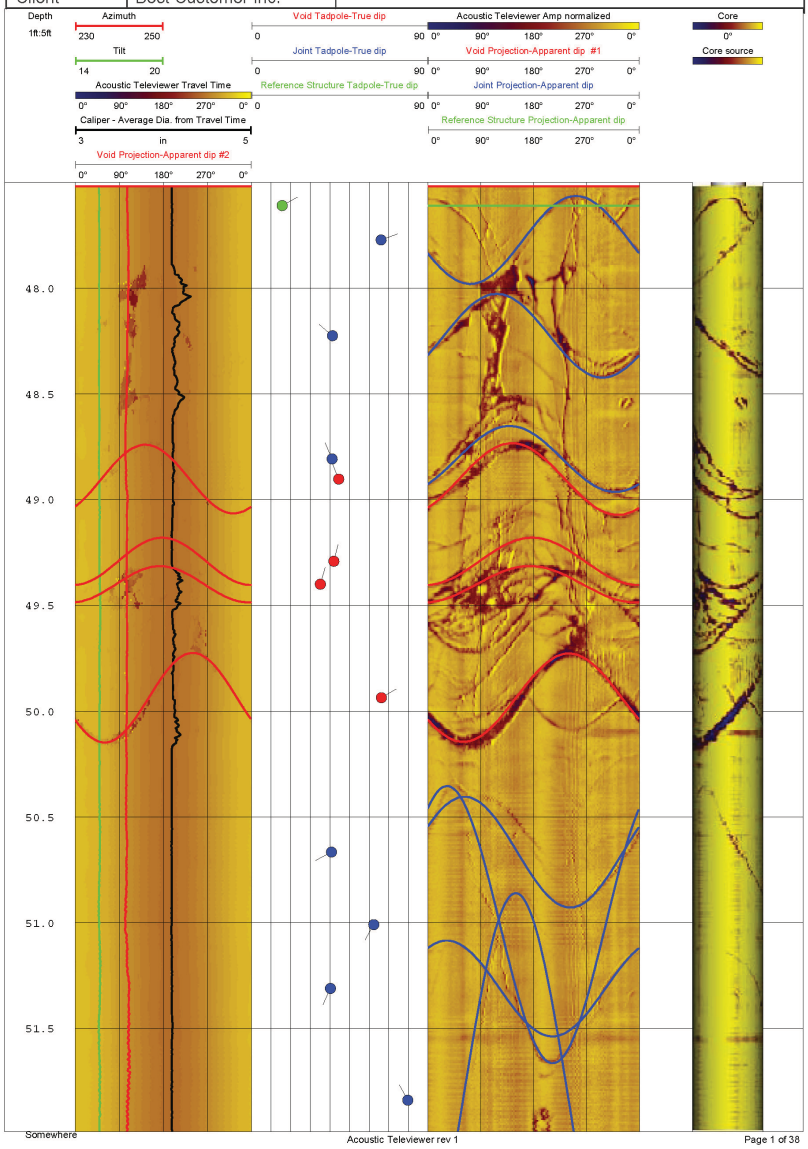
B-XXX	Company	Geovision Geophysical Services
	Location	Somewhere Dam

BH	B-XXX Acoustic Televiewer		
Date	7/8/05	BH Fluid	Air/Water
Casing	4" Steel to 15 ft		
File Name	BXXXdown1		
Depth Drilled	300 feet		
Depth Logged	299.3 feet		
Logged by	Rob Steller		
Client	Best Customer Inc.		

Notes:

1) All orientations referenced to True North

2) Tadpole tails indicate dip direction with True North as up.



PROCEDURE FOR

OYO P-S SUSPENSION SEISMIC VELOCITY LOGGING

Background

This procedure describes a method for measuring shear and compressional wave velocities in soil and rock. The OYO P-S Suspension Method is applied by generating shear and compressional waves in a borehole using the OYO P-S Suspension Logger borehole tool and measuring the travel time between two receiver geophones or hydrophones located in the same tool.

Objective

The outcome of this procedure is a plot and table of P and S_H wave velocity versus depth for each borehole. Standard analysis is performed on receiver to receiver data. Processed data is presented in report format, and transmitted in Excel, Word or ASCII format.

Instrumentation (Figure 1)

1. OYO Model 170 Digital Logging Recorder, Robertson Model 3403 Digital Telemetry, or equivalent (top right corner of Figure 1, and Table 1)

2. OYO P-S Suspension Logger probe or equivalent, including two sets horizontal and vertical geophones or hydrophones (hereafter referred to simply as “geophones”), seismic source, and power supply for the source and receivers (this is everything down in the borehole in Figure 1)

3. Winch and winch controller, with logging cable (Figure 1)

4. Batteries to operate P-S Logger and winch (not shown)

The Suspension P-S Logger system, manufactured by OYO Corporation, or the Robertson Digital P-S Suspension Probe with the Robertson Micrologger2 are currently the only two types of commercially available suspension logging systems. As shown in Figure 1, these systems consists of a borehole probe suspended by a cable and a recording/control electronics package on the surface.

The suspension system probe consists of a combined reversible polarity solenoid horizontal shear-wave generator (S_H) and compressional-wave generator (P), joined to two biaxial geophones by a flexible isolation cylinder. The separation of the two geophones is one meter, allowing average wave velocity in the region between the geophones to be determined by inversion of the wave travel time between the two geophones. The total length of the probe is

approximately 7 meters; the center point of the geophones is approximately 4 meters above the bottom end of the probe.

The probe receives control signals from, and sends the amplified geophone signals to, the instrumentation package on the surface via an armored 4 or 7 conductor cable. The cable is wound onto the drum of a winch and is used to support the probe. Cable travel is measured by a rotary encoder to provide probe depth data.

The entire probe is suspended by the cable and may be centered in the borehole by nylon "whiskers." Therefore, source motion is not coupled directly to the borehole walls; rather, the source motion creates a horizontally propagating pressure wave in the fluid filling the borehole and surrounding the source. This pressure wave produces a horizontal displacement of the soil forming the wall of the borehole. This displacement propagates up and down the borehole wall, in turn causing a pressure wave to be generated in the fluid surrounding the geophones as the soil displacement wave passes their location.

Environmental Conditions

The OYO P-S Suspension Logging Method can be used in either cased or uncased boreholes. For best results, the uncased borehole must be between 10 and 20 cm in diameter, or 4 to 8 inches. A cased borehole may be as small as 3 inches, if properly grouted (see below). The grout annulus may be up to 2 inches for a 4 inch casing. A smaller annulus is preferred for 3 inch casing.

Uncased boreholes are preferred because the effects of the casing and grouting are removed. It is recommended that the borehole be drilled using the rotary mud method. This method does little damage to the borehole wall, and the drilling fluid coats and seals the borehole wall reducing fluid loss and wall collapse. The borehole fluid is required for the logging, and must be well circulated prior to logging.

If the borehole must be cased, the casing must be PVC and properly installed and grouted. Any voids in the grout will cause problems with the data. Likewise, large grout bulbs used to fill cavities will also cause problems. The grout must be set before testing. This means the grouting must take place at least 48 hours before testing.

For borehole casing, applicable preparation procedures are presented in ASTM Standard D4428/D4428M-91 Section 4.1 (see ASTM website for copy).

Calibration

Calibration of the digital logger/recorder is required. Calibration is limited to the timing accuracy of the logger/recorder. GEOVision's "Suspension PS Logger/Recorder Calibration Procedure" or equivalent should be used. Calibration must be performed on an annual basis. The following table details the specific instruments calibrated:

Table 1 Explanation of Instrument Calibration

TYPE OF LOGGER/RECORDER	LOCATION OF CALIBRATED DIGITIZER	CALIBRATED MODEL NUMBER	RECORDS ON
OYO (JAPAN)	Seismograph at the surface	PS-170 Model 3331 or 3331A	Laptop via PS-170
Robertson (UK)*	Telemetry Unit at top of probe in the borehole (Figure 1)	Model 3403	Laptop via RG MicroLogger2

* Robertson GeoLogging (RG) is a subsidiary of OYO International of Japan. The RG probe sections may still say "OYO" even though they are sold by RG from the UK.

Measurement Procedure

The entire probe is lowered into the borehole to a specific measurement depth by the winch. A measurement sequence is then initiated by the operator from the instrumentation package control panel. No further operator intervention is then needed to complete the measurement sequence described below.

The system electronics activates the SH-wave source in one direction and records the output of the two horizontally oriented geophone axes which are situated parallel to the axis of motion of the source. The source is then activated in the opposite direction, and the horizontal output signals are again recorded, producing a SH-wave record of polarity opposite to the previous record. The source is finally actuated in the first direction again, and the responses of the vertical geophone axes to the resultant P-wave are recorded during this sampling.

The data from each geophone during each source activation is recorded as a different channel on the recording system. The seismograph has at least six channels (two simultaneous recording channels), each with at least a 12 bit 1024 sample record. Newer seismographs may have longer record lengths. The recorded data is displayed on a CRT or LCD display as six channels with a common time scale. Data is stored on digital media for further processing. Up to 8 sampling sequences can be stacked (averaged) to improve the signal to noise ratio of the signals.

Review of the data on the display allows the operator to set the gains, filters, delay time, pulse length (energy), sample rate, and stacking number in order to optimize the quality of the data before recording. Digital media should be verified from time-to-time by opening saved files (at least one) and viewing stored data. This should also be done on transferred or back-up files (see item 2 under required Field Records).

Typical depth spacing for measurements is 1.0 meters, or 3.3 feet. Alternative spacing is 0.5 meter, or 1.6 feet.

Required Field Records

1) Field log for each borehole showing

   a) Borehole identification

   b) Date of test

   c) Tester or data recorder

   d) Description of measurement

   e) Any deviations from test plan and action taken as a result

2) Data must be stored in at least 2 places, such as the laptop hard disk and CDRom, or hard disk and USB flash drive, or uploaded to FTP, prior to leaving the site.

3) List of record ID numbers (for data on digital media) and corresponding depth

4) All removable digital media, such as CDRoms or USB flash drives with backup copies of data on hard disk, must be "labeled" with job number, borehole designation, record ID number range, date, and tester name. For USB flash drives or hard disks on separate computers, the "label" can be a .txt file with this information, or even a PSLOG .sps file with preliminary information stored. File directories should have job number, project name and borehole name.

An example Field Log is attached to this procedure.

Analysis

Following completion of field work, the recorded digital records are processed by computer using the OYO Corporation software program PSLOG and interactively analyzed by an experienced geophysicist to produce plots and tables of P and S_H wave velocity versus depth.

The digital time series records from each depth are transferred to a personal computer for analysis. Figure 2 shows a sample of the data from a single depth. These digital records are analyzed to locate the first minima on the vertical axis records, indicating the arrival of P-wave energy. The difference in travel time between these arrivals is used to calculate the P-wave velocity for that 1-meter interval. When observable, P-wave arrivals on the horizontal axis records are used to verify the velocities determined from the vertical axis data. In addition, the soil velocity calculated from the travel time from source to first receiver is compared to the velocity derived from the travel time between receivers.

The digital records are studied to establish the presence of clear SH-wave pulses, as indicated by the presence of opposite polarity pulses on each pair of horizontal records. Ideally, the SH-wave signals from the 'normal' and 'reverse' source pulses are very nearly inverted images of each other. Digital FFT – IFFT lowpass filtering may be used to remove the higher frequency P-wave signal from the SH-wave signal.

The first maxima are picked for the 'normal' signals and the first minima are picked for the 'reverse' signals. The absolute arrival time of the 'normal' and 'reverse' signals may vary by +/- 0.2 milliseconds, due to differences in actuation time of the solenoid source caused by constant mechanical bias in the source or by borehole inclination. This variation does not affect the velocity determinations, as the differential time is measured between arrivals of waves created by the same source actuation. The final velocity value is the average of the values obtained from the 'normal' and 'reverse' source actuations.

In Figure 2, the time difference over the 1-meter interval of 1.70 millisecond is equivalent to a SH-wave velocity of 588 m/sec. Whenever possible, time differences are determined from several phase points on the S_H -wave pulse trains to verify the data obtained from the first arrival of the S_H -wave pulse. In addition, the soil velocity calculated from the travel time from source to first receiver is compared to the velocity derived from the travel time between receivers.

Figure 3 is a sample composite plot of the far normal horizontal geophone records for a range of depths. This plot shows the waveforms at each depth, clearly showing the S-wave arrivals. This display format is used during analysis to observe trends in velocity with changing depth.

Once the proper picks are entered in PSLOG, the picks are transferred to an Excel spreadsheet where Vs and Vp are calculated. The spreadsheet allows output for presentation in charts and tables.

Standard analysis is performed on receiver 1 to receiver 2 data, with separate analysis performed on source to receiver data as a quality assurance procedure.

Registered Geophysicist Antony J Martin Date 10/7/10

QA Review Date 10/7/10

References:

1. "In Situ P and S Wave Velocity Measurement", Ohya, S. 1986. Proceedings of In-Situ '86, *Use of In-Situ Tests In Geotechnical Engineering*, an ASCE Specialty Conference sponsored by the Geotechnical Engineering Division of ASCE and co-sponsored by the Civil Engineering Dept of Virginia Tech.

2. Guidelines for Determining Design Basis Ground Motions, Report TR-102293, Electric Power Research Institute, Palo Alto, California, November 1993, Sections 7 and 8.

3. "Standard test Methods for Crosshole Seismic Testing", ASTM Standard D4428/D4428M-07, approved July 1, 2007.

OYO SUSPENSION P-S VELOCITY LOGGING SETUP

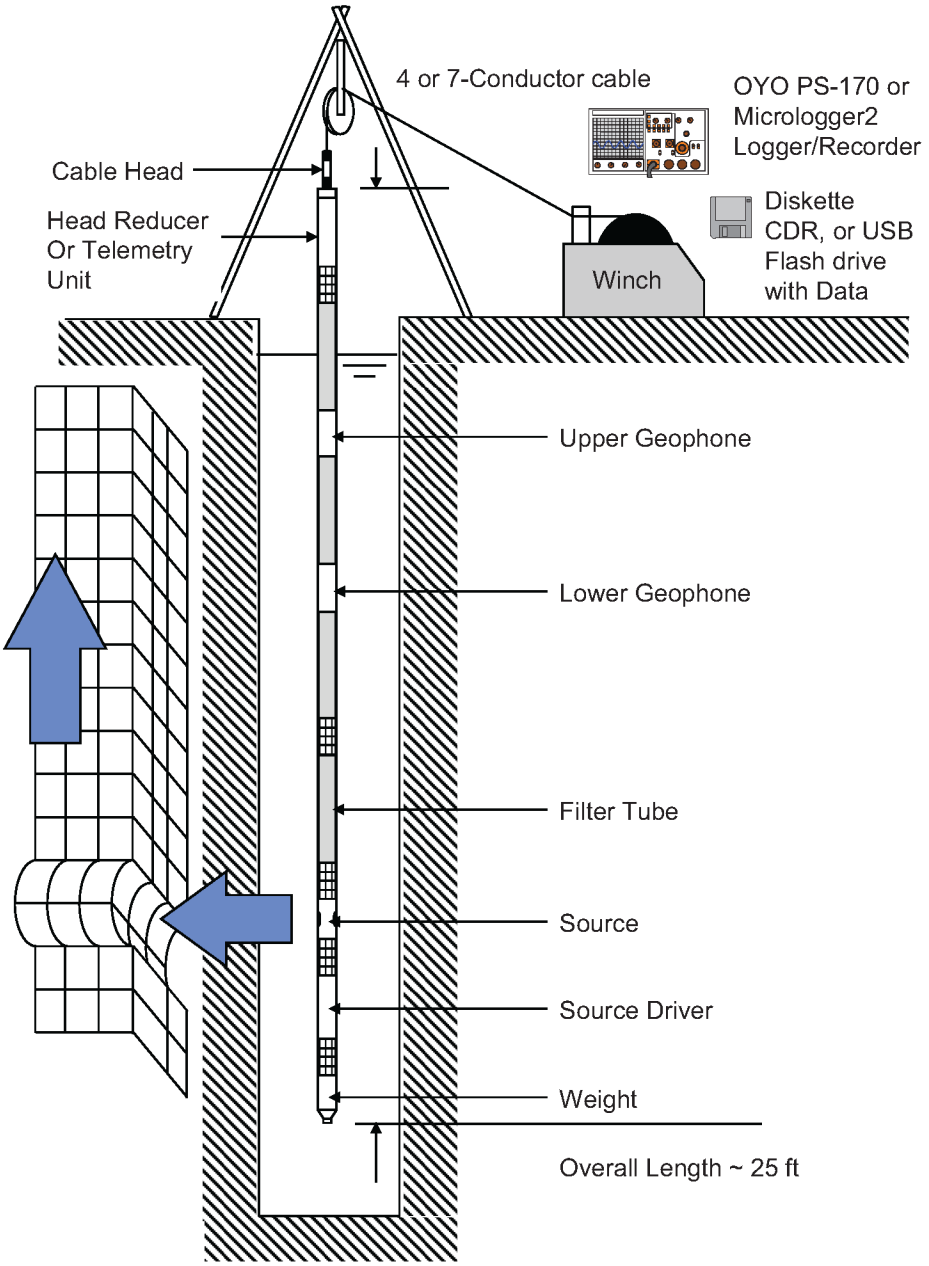


Figure 1. Suspension PS logging method setup

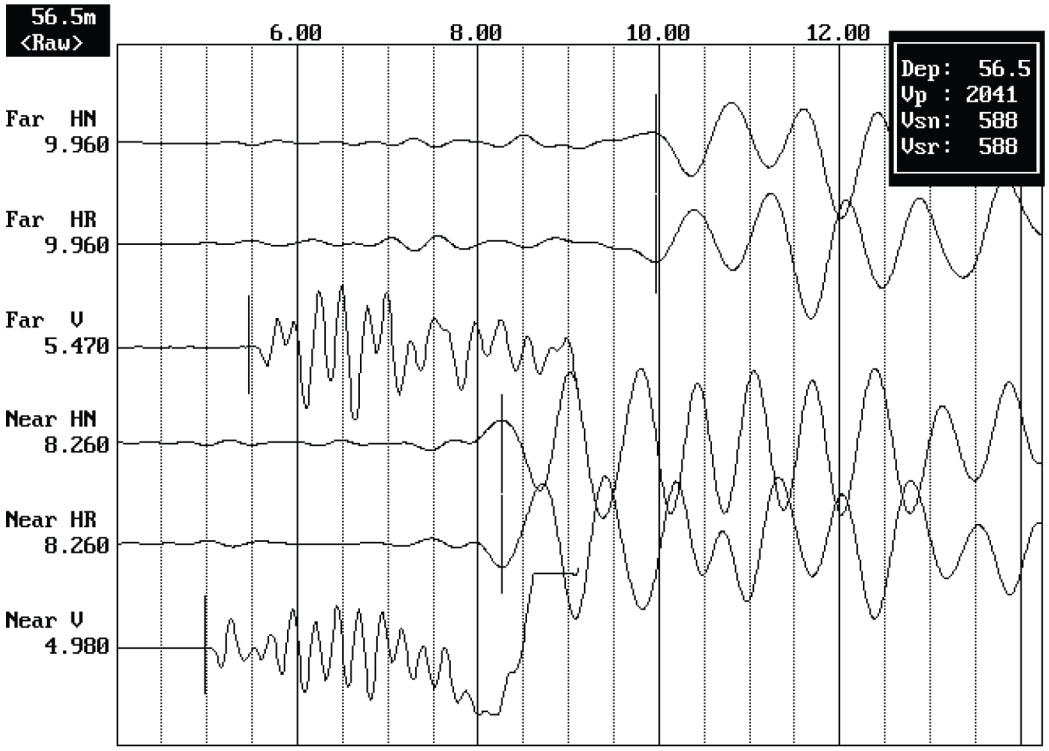


Figure 2. Sample suspension method waveform data showing horizontal normal and reversed (HR and HN), and vertical (V) waveforms received at the near (bottom 3 channels) and far (top 3 channels) geophones. The arrivals in milliseconds for each pick are shown on the left. The box in the upper right corner shows the depth in the borehole and the velocities calculated based on the picks.

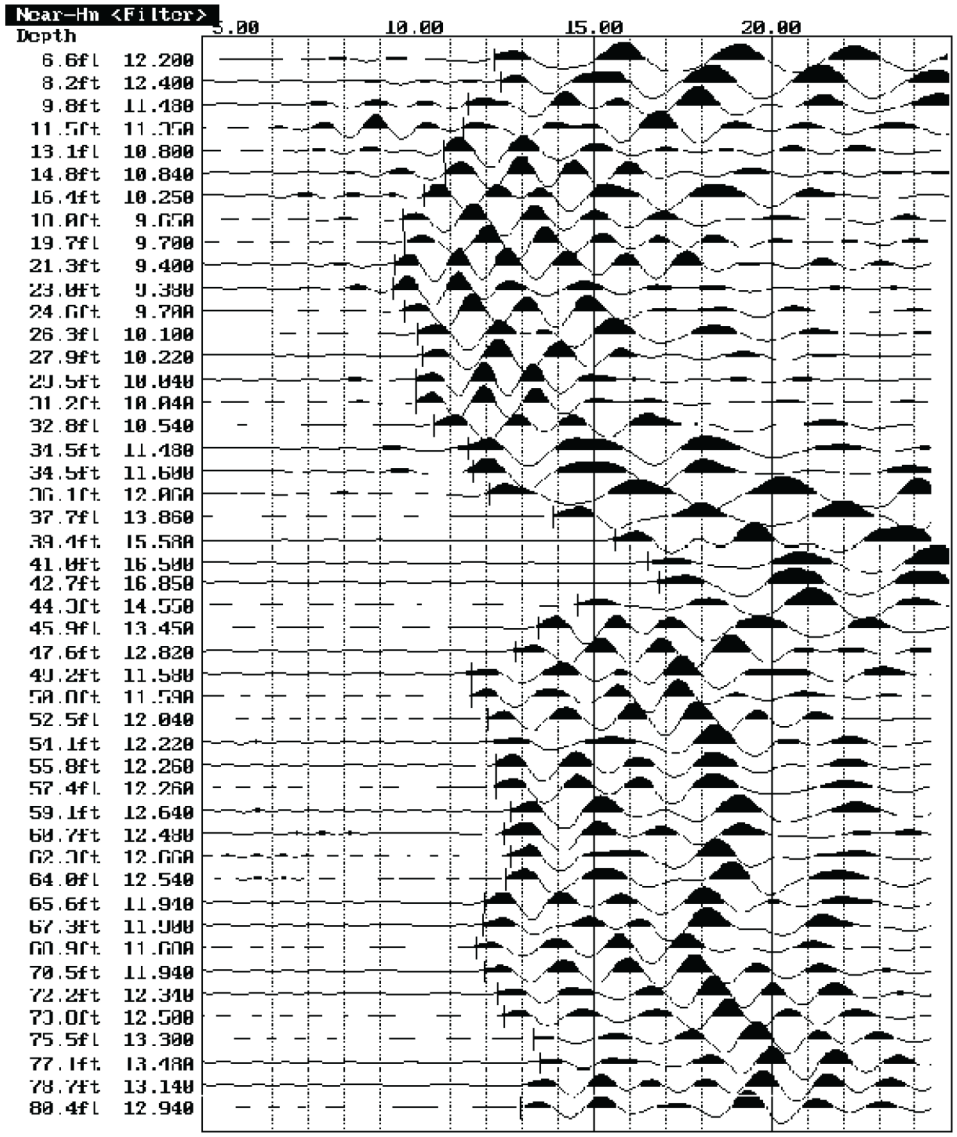
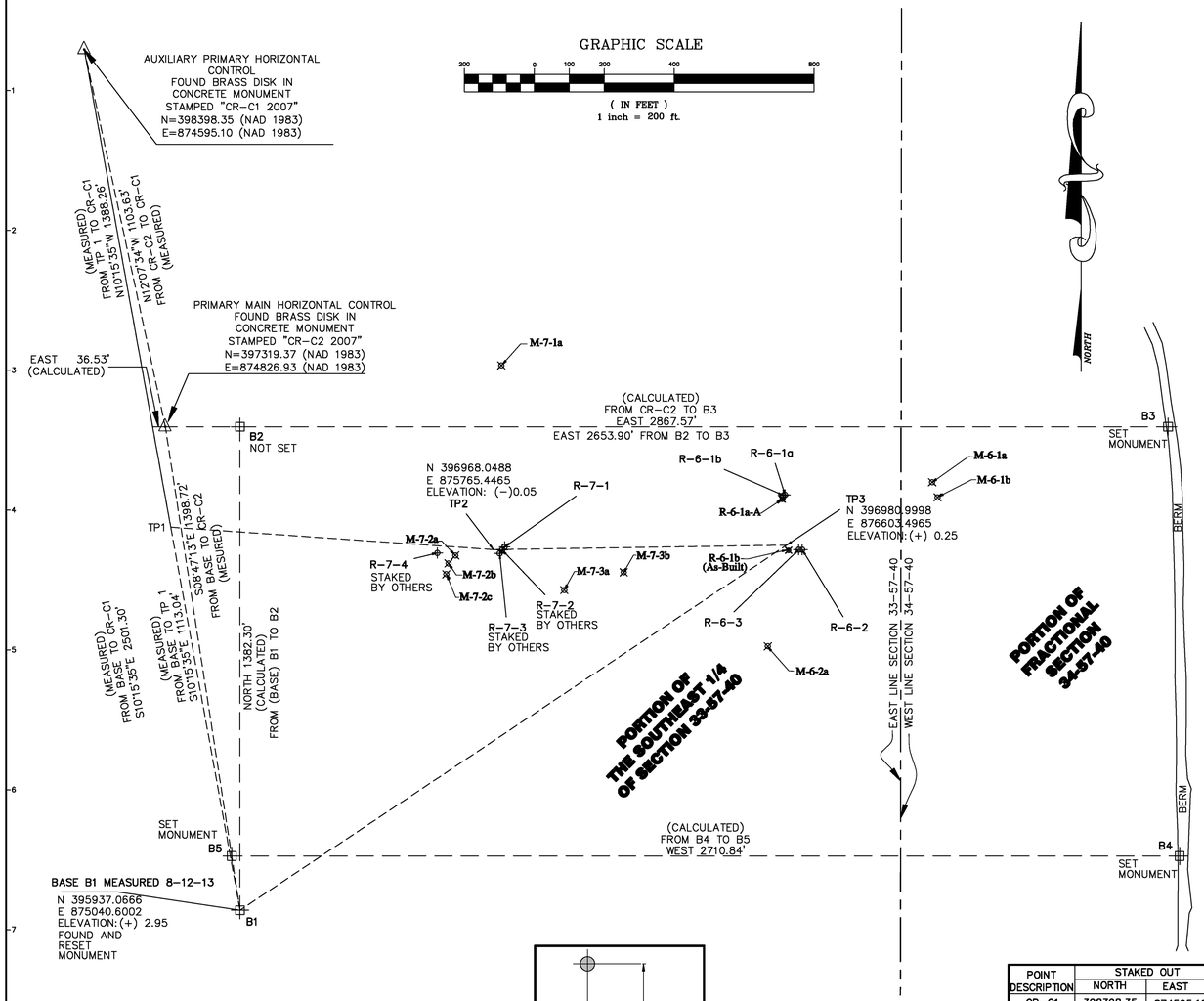


Figure 3. Sample composite waveform plot for normal shear waves received at the near geophone in a single borehole

APPENDIX H

SURVEY FINAL REPORT

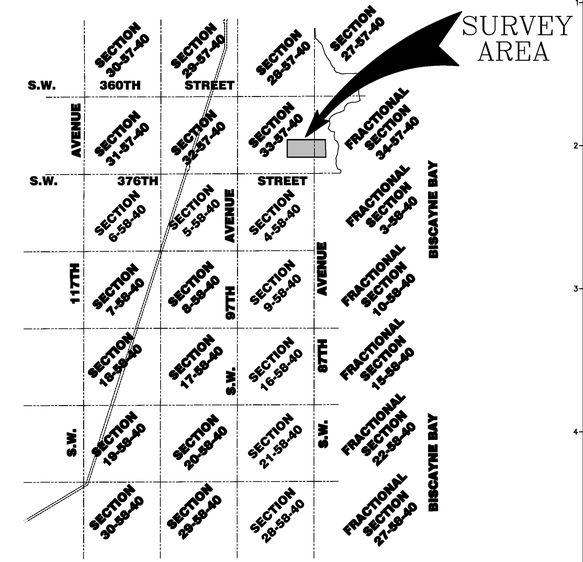


PRIMARY MAIN HORIZONTAL CONTROL
FOUND BRASS DISK IN
CONCRETE MONUMENT
STAMPED "CR-C2 2007"
N=397319.37 (NAD 1983)
E=874826.93 (NAD 1983)
ELEVATION: 3.68 (NAVD88)

H111 FOUND BRASS DISK IN
CONCRETE MONUMENT
LATITUDE: 25°26'52.39299" (NAD 83)
LONGITUDE= 080°24'43.15420" (NAD 83)
COORDINATES
N 405457.43 (NAD 83)
E 850195.56 (NAD 83)

AUXILIARY PRIMARY HORIZONTAL CONTROL
FOUND BRASS DISK IN
CONCRETE MONUMENT
STAMPED "CR-C1 2007"
N=398398.35 (NAD 1983)
E=874595.10 (NAD 1983)
ELEVATION: 4.58 (NAVD88)

2 RM 2 FOUND
CONCRETE MONUMENT
WITH STANDARD COAST AND GEODETIC
REFERENCE MARK DISK
LATITUDE: 25°26'19.50713" (NAD 83)
LONGITUDE= 080°19'03.38674" (NAD 83)
COORDINATES
N 402285.75 (NAD 83)
E 881356.31 (NAD 83)



LOCATION MAP

Sections 33 and 34, Township 57 South, Range 40 East,
Miami-Dade County, Florida.
(Not To Scale)

LEGAL DESCRIPTION:

Portions of Section 33 and Fractional Section 34, Township 57 South, Range 40 East, Miami-Dade County, Florida.

SURVEYOR'S NOTES:

1) Accuracy: The expected use of the land, as classified in the Minimum Technical Standards (5J-17FAC), is "Industrial". Error of Closure calculated to be 0.08 feet in 10,000 feet.
2) Not valid without the signature and the original raised seal of a Florida Licensed Surveyor and Mapper. Additions or deletions to survey maps or reports by other than the signing party or parties is prohibited without written consent of the signing party or parties.
3) Elevations shown hereon are based on the National American Vertical Datum of 1988.
3a) Bench Mark use: LM 18 316 FLPCO Elevation 3.70 (NAVD88) Bench Mark is a Stainless Steel Bolt and Washer cemented in a 1.5 inch diameter pvc pipe.
4) Type of Survey: SPECIFIC PURPOSE SURVEY.
4a) The specific purpose of this Sketch of Survey is to show the relative position of the Boring Test Holes. The relative position of the Boring Test Holes are based on Coordinate Values provided by client and were Stakeout in the field using the published information for control point CR-C2, shown herein and by using Traditional Surveying Methods such as Triangulation and Closed Traverses.
5) North arrow direction, Bearings and Coordinates shown hereon refer to the State of Florida Transverse Mercator Grid System, East Zone, North American Datum of 1983.(SEE NOTE 7a)
6) This PLAN OF SURVEY, has been prepared for the exclusive use of the entities named hereon. The Certificate does not extended to any unnamed party:
a. PAUL C. RIZZO ASSOCIATES, INC.
b.
c.
7) Field Book: A-507 Project No.:13-073-5602
Data Collector File: FPL.CVS
8) The Sources of Data used for the preparation of this Specific Purpose Survey Data Sheets National Geodetic Survey Published by National Oceanic and Atmospheric Administration (NOAA) for 2RM 2 AND H111.

9) This Specific Purpose Survey is intended to be displayed at a scale of One inch equals 200 feet or smaller.

SURVEYOR'S CERTIFICATE:

I Hereby Certify to the best of my knowledge and belief that this drawing is a true and correct representation of the SPECIFIC PURPOSE SURVEY of the real property described hereon.

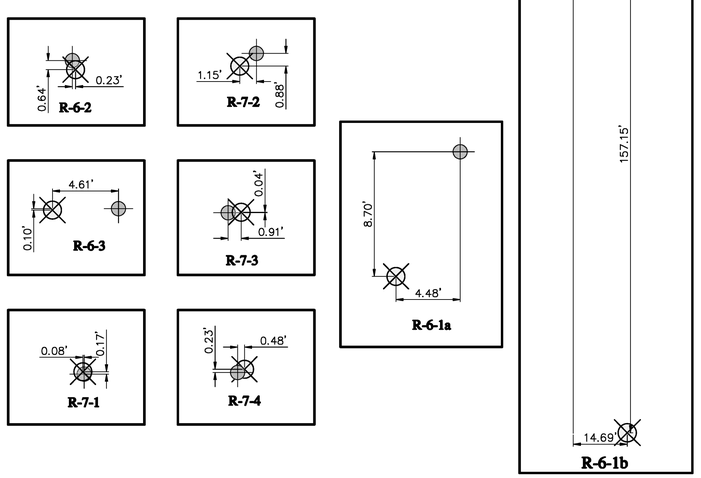
I further certify that this survey was prepared in accordance with the applicable provisions of Chapter 5J-17, Florida Administrative Code.

FORD, ARMENTEROS & FERNANDEZ, INC, LB 6557

Original Field Work Survey Date: August 13th, 2013
Revision Date: October 17, 2013. (As-built boring).
Revision Date: October 30, 2013. (Revision).
Revision Date:

Omar Armenteros, P.L.S. For The Firm
Professional Land Surveyor, LS 3679
State of Florida.

DETAILS
NOT TO SCALE



LEGEND:

- STAKE OUT
- AS-BUILT

POINT DESCRIPTION	STAKED OUT NORTH	STAKED OUT EAST	AS-BUILT NORTH	AS-BUILT EAST	AS-BUILT ELEV.	Y-X DIFFERENCE (STAKE VS. AS-BUILT) Y (NORTH)	X (EAST)
CR-C1	398398.35	874595.10					
CR-C2	397319.37	874826.93					
BASE	395937.07	875040.60					
TP 1	397032.33	874842.46					
TP 2	396968.05	875765.45					
TP 3	396981.00	876603.50					
B1	395937.07	875040.60					
B2	397319.37	875040.60					
B3	397319.37	877694.50					
B4	396091.82	877727.52					
B5	396091.82	875016.68					
R-7-1	396976.06	875797.39	396976.23	875797.30	0.22	+0.17	-0.08
R-6-2	396967.87	876647.99	396967.24	876648.22	-0.06	-0.64	+0.23
R-7-2 *	396966.91	875790.01	396966.03	875788.86	0.06	-0.88	-1.15
R-6-3	396967.85	876637.97	396967.75	876633.36	-0.15	-0.10	-4.61
R-7-3 *	396957.26	875782.88	396957.30	875783.79	0.01	+0.04	+0.91
R-6-1a	397124.45	876599.19	397115.74	876594.72	-0.07	-8.70	-4.48
R-6-1b	397123.24	876594.34	396966.10	876609.04	-0.03	-157.15	+14.69
R-7-4 *	396958.28	875604.74	396958.51	875605.22	-0.53	+0.23	+0.48
R-6-1a-A*			397112.22	876590.79	-0.09		
M-6-1a *	397169.70	876982.06	397160.96	877019.73			
M-6-1b *	397140.23	876990.95	397117.71	877034.98			
M-6-2a *	396763.28	876527.93	396691.76	876549.80			
M-7-1a *	397494.08	875801.25	397495.08	875787.83			
M-7-2a *	396965.69	875653.61	396951.72	875656.19			
M-7-2b *	396942.10	875643.28	396928.33	875636.38			
M-7-2c *			396897.85	875630.22			
M-7-3a *	396877.00	876100.45	396852.38	875967.82			
M-7-3b *	396877.00	876143.25	396903.26	876137.69			
ML-1 *					-1.12		

* STAKED BY OTHERS

THIS IS A SPECIFIC PURPOSE SURVEY
(THIS IS NOT A BOUNDARY SURVEY)

FORD, ARMENTEROS & FERNANDEZ, INC
1950 N.W. 94th AVENUE, 2nd FLOOR
DORAL, FLORIDA 33172
PH. (305) 477-6472
FAX (305) 470-2905
L.B. No. 6557

DRAWINGS AND SPECIFICATIONS AS INSTRUMENTS OF SERVICE ARE AND SHALL REMAIN THE PROPERTY OF FORD, ARMENTEROS & FERNANDEZ, INC., WHETHER THE PROJECT FOR WHICH THEY ARE MADE IS EXECUTED OR NOT. THEY ARE NOT TO BE USED BY OWNER OR OTHER PROJECT EXCEPT BY AGREEMENT IN WRITING AND WITH APPROPRIATE COMPENSATION TO FORD, ARMENTEROS & FERNANDEZ, INC.

RECORD OF REVISION

No.	DATE	DESCRIPTION	BY	APP.
1	10-17-13	AS-BUILT BORINGS.	L.D.	O.A.
2	10-30-13	COMMENTS PER RIZZO	L.D.	O.A.

TURKEY POINT UNITS 6 & 7 SITE

TYPE OF PROJECT: SPECIFIC PURPOSE SURVEY
SHEET NAME: SKETCH OF SURVEY AND SURVEYOR'S NOTES
CLIENT: PAUL C. RIZZO ASSOCIATES, INC
CLIENT ADDRESS: 600 PENN CENTER BLVD, SUITE 100 PITTSBURGH, PA 15235
PROJECT LOCATION: SECTIONS 33, TOWNSHIP 57 SOUTH, RANGE 40 EAST MIAMI-DADE COUNTY, FLORIDA

SCALE: AS SHOWN
DRAWN BY: R.RODRIGUEZ
ENG. CHECKED BY:
QUALITY CONTROL:
DATE: AUGUST 13, 2013
PROJECT No: 13-073-5602
SHEET: 1 OF 1 SHEETS

CAD FILE: G:\FORD COMPANIES\ENGINEERING & SURVEYING\SURVEY\PROJECTS\13-073 TURKEY POINT\13-073-5602.DWG