US Army Corps
of Engineers

Construction of Distal Monitor Well No. 19, Kissimmee River ASR Pilot Site, Okeechobee County, Florida

FDEP/UIC FILE NO. 200917-003-UC **CONTRACT NO. W912EP-06-D-0015**

JULY 2010

ENTRIX FILE NO.: 00061013.00

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ENTRIX
Down to Earth. Down to Business.

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SECTION 1.0

Introduction

This report outlines the construction of the Aquifer Storage and Recovery (ASR) Storage Zone Monitor Well No. 19. The United States Army Corp of Engineering (USACE) operates the ASR facility to assess recharge and recovery of treated surface water from the Kissimmee River, using the upper Floridan Aquifer System. The recovered water is proposed to maintain water levels in Lake Okeechobee and its tributaries throughout the dry season.

ENTRIX, Inc. (ENTRIX) was authorized by USACE to construct a distal monitor well within approximately 4,200 feet of the pilot ASR well. Construction of Monitor Well No. 19 (MW-19) began on October 23, 2009 and was completed on January 20, 2010. MW-19 was cased to 570 feet below land surface (bls) and extends to about 880 feet bls within the Upper Floridan Aquifer.

Please refer to Figure 1 and Figure 2 for a General Location Map and Site Location Map for MW-19. Diversified Drilling Corporation ("DDC" or the "Subcontractor") was responsible for all drilling, construction and testing of MW-19. ENTRIX performed field oversight of these same construction and testing procedures. The Construction Permit for MW-19 is provided as Appendix 1.0.1. An as-built GPS well location report is provided as Appendix 1.0.2.

SECTION 2.0

Well Construction Details

2.1 PIT CASING

ENTRIX observed and documented the installation of a 24-inch diameter steel pit casing at the proposed MW-19 location using a cable-tool drilling rig. The 24-inch diameter pit casing for MW-19 was prepared by welding of a drive shoe on the bottom of the lower section and by welding of a drive coupling to the top of the section. The first 21-foot section was driven to a depth of approximately 19 feet below land surface (bls) using, a drive hammer connected to the cable-tool rig. Powdered bentonite was introduced into the annular space between the casing and the ground as the casing was driven. The upper 21-foot long section (of the 24-inch diameter pit casing) was welded to the previously driven section of casing and then the casing sections were driven to a depth of 42 feet bls. The cable-tool rig with a bit and a bailer were utilized to excavate the material inside the pit casing to a depth of 32 feet bls.

2.2 TEMPORARY DRILL PAD

A temporary, rock-base drill pad was constructed around the pit casing. Once the temporary drill pad was graded to completion, the Subcontractor began installation of a 60-mil high-density polyethylene (HDPE)-liner for the pad area where the drilling rig and mud-storage system will be located. The Subcontractor then used neat Portland-type cement as the seal between the 24-inch diameter pit casing and the HDPE liner material. Mud-rotary drilling method was used to clear the sediments from the previously installed surface casing using the nominal 24-inch diameter bit (as a reamer) to 40 feet bls.

2.3 PILOT HOLE

A nominal 12-inch diameter bit was used to begin drilling the pilot hole below the surface casing. The 12-inch borehole was advanced via mud rotary from 40 feet bls to approximately 215 feet bls. Mud-rotary drilling method was used to ream the previously drilled pilot hole using a nominal 24-inch diameter bit (as a reamer) from approximately 40 feet bls to 218 feet bls.

2.4 CASING MATERIALS AND SETTING DEPTH FOR SURFACE CASING

On December 7, 2010, 218 feet of 16-inch diameter, 0.375-inch wall steel casing with centralizers was installed in the nominal 24-inch diameter borehole. A casing tally is included in Appendix 2.4.1. The annulus was pressure grouted with 167 sacks of Neat Portland cement plus 118 sacks of Portland cement with 3% bentonite. The annular cement was determined to be at 16 feet bls on December 8, 2010, and additional Portland cement with 3% bentonite was pumped into the annulus to bring the annular cement to land surface. The DDC cementing report is included in Appendix 2.4.2. The Cement Record for the 16-inch diameter casing is included as Table 2.4.

Table 2.4 – Cement Record for Surface 16-inch diameter casing of MW-19

Stage	Date	Cement Additives	Yield (cf/sk)	Sacks used	Borehole Interval (ft bls)	Theoretical Fill (ft)	Actual Fill (ft)	Tag Depth (ft bpl)	Percent Theoretical (ft)
1	12/7/09	Neat	1.18	167	118-218	100			
		3% Bentonite	1.49	224	0 -118	118	212 Cumulative	16	97%
2	12/8/09	Neat	1.18	15	0-16	16	16	0	100%

2.5 CASING MATERIALS, SETTING DEPTHS & GROUTING OF INNER CASING

Florida Department of Environmental Protection (FDEP) acceptance of the proposed casing-setting depth was issued after reviewing the geophysical logs and lithologic log of the borehole. A 6-inch diameter Certa-Lok® PVC casing was installed to a depth of 570 feet bls. The casing was installed with a two-stage cementing basket at the base of the casing. Five (5) cementing stages were completed from December 22, 2009 to December 28, 2009. A casing tally is included as Appendix 2.6.1 and the cementing report is included as Appendix 2.6.2. Please refer to Figure 3 for a well construction diagram.

Table 2.5 – Cement Record for the 6-inch diameter final casing of MW-19

Stage	Date	Cement Additives	Yield (cf/sk)	Sacks used	Borehole Interval (ft bls)	Theoretical Fill (ft)	Actual Fill (ft)	Tag Depth (ft bpl)	Percent Theoretical (ft)
1	12/22/09	3% Bentonite	1.49	5	560-570	10	---	---	---
1a	12/22/09	3% Bentonite	1.49	5	550-560	10	18*	552*	90%*
2	12/23/09	3% Bentonite	1.49	86	477-552	75	77	475	103%
3	12/23/09	3% Bentonite	1.49	162	325-475	150	280	195	186%
4	12/24/09	3% Bentonite	1.49	109	38-195	157	181	14	115%
5	12/28/09	3% Bentonite	1.49	15	0-14	14	14	0	100%
*Cumulative									

2.6 OPEN-HOLE DEPTHS

A 15-inch diameter borehole was drilled below the base of the 16-inch diameter surface casing using the mud-rotary drilling method. Drilling continued on the 15-inch diameter borehole to a depth 573 feet bls. At this point, the drill bit was changed to a nominal 12-inch diameter drill bit. The nominal 12-inch diameter borehole was extended from 573 feet bls to the total well depth of 880 feet bls.

2.7 WELLHEAD CONSTRUCTION

On January 5, 2010, an inflatable packer was set below the top of the casing to eliminate flow from the well. The remaining annulus between the 16-inch diameter steel surface casing and the 6-inch diameter PVC casing was grouted to land surface with Portland Type I/II cement and 4-percent bentonite. The wellhead then was assembled per specifications. The Subcontractor then performed site cleanup and formed the 6-foot by 6-foot concrete pad around the well. A wellhead construction detail is presented as Figure 4. A specification sheet for the installed wellhead pressure gauge is provided as Appendix 2.7.1.

SECTION 3.0

Monitor Well Testing Details

3.1 MECHANICAL INTEGRITY TESTING

MW-19 is to be utilized as a monitor well. The Mechanical Integrity Testing performed on the well was limited to a hydrostatic pressure test of the final 6-inch diameter casing.

An inflatable-packer device was installed into MW-19 and the device was set and inflated near the base of the casing (563 feet bls). The casing was pressurized to 50 pounds per square inch (psi) and the pressure fall-off was recorded. The casing pressure change over one hour was 2.1 psi (4.2 percent change) and was within the allowable 5-percent pressure change per one hour specification. The hydrostatic pressure test results are included as Appendix 3.1.

3.2 SPECIFIC-CAPACITY TESTING

A test pump was installed in the well and specific-capacity testing was conducted on January 6, 2010. The well was pumped at a production rate of 210 gallons per minute (gpm) for 2 hours and 15 minutes and periodic water-level measurements were collected at approximately 5-minute intervals. A test record is included as Appendix 3.2. The calculated specific capacity is approximately 3.45 gpm per foot of drawdown.

3.3 WATER QUALITY

Groundwater samples were collected from MW-19, and were then placed in a cooler with ice prior to being sent overnight to Jupiter Environmental Laboratories, Inc., for analyses. The samples were analyzed for metals, alkalinity, total dissolved solids, sulfide, ion chromatography, and gross alpha. The wellhead assembly was completed to specifications and verified by ENTRIX field personnel. For sampling purposes, one well volume of MW-19 is equivalent to 1,308 gallons or approximately six and a half minutes of flow at the same production rate used for the specific-capacity test. The laboratory results and Chain of Custody (COC) of the groundwater samples are included as Appendix 3.3.

3.4 GEOPHYSICAL LOGGING

Geophysical logging consisted of caliper, natural gamma-ray, electric and sonic logging, and a video log at specific points during well construction. A caliper and gamma-ray log was conducted by MV Geophysical of the reamed 16-inch diameter borehole. Geophysical logging was completed in the nominal 12-inch diameter borehole to the termination depth of 880 feet bls. The geophysical logging included X-Y caliper, natural gamma-ray plots, dual induction and sonic borehole-density logs. The geophysical logs are included as Appendix 3.4.1.

A video survey was completed to a total depth of 880 feet bls. A video log summary was completed and is provided along with a DVD copy of the log as Appendix 3.4.2. The video indicated that scoring of the casing occurred during well development but was otherwise unremarkable.

SECTION 4.0

Hydrogeologic Evaluation

4.1 STRATIGRAPHY

The geologic sequence for the Kissimmee River ASR MW-19 is based primarily on the data obtained during the construction of MW-19, comparison with 23 other wells from the Florida Geological Survey's Lithologic database from Glades, Okeechobee and Martin Counties, as well as the Kissimmee River ASR MW-18. The pit casing for MW-19 was driven using a cable-tool rig after which an attempt was made to remove the strata within the casing using the cable tool rig. This proved to be largely unsuccessful and disrupted the strata within the casing to such an extent that the cuttings were deemed unusable when the casing was eventually cleared using the mud-rotary method.

The geologic units encountered during the construction of MW-19 include, from youngest to oldest, undifferentiated Pliocene to Holocene strata, the Peace River Formation of the Hawthorn Group, the Arcadia Formation of the Hawthorn Group, the Suwannee Limestone, the Ocala Limestone, and the Avon Park Formation. Each of these stratigraphic units is described in detail below. Based in part on the results of previous well installations for the Kissimmee River ASR well system (by others), the depth recommendation for the base of the MW-19 casing was confirmed by the depth at which a decrease in the gamma-ray log amplitude occurs immediately above the base of the (tentatively-identified) Suwannee Limestone Equivalent (at 560 feet bls). Please refer to Appendix 4.1 for the lithologic log of MW-19.

Undifferentiated Pliocene to Holocene Strata

The uppermost lithologic units encountered at the site of MW-19 are the sands, clays, and carbonates of the undifferentiated Pliocene to Holocene strata. Lithologic samples were not collected from the upper 40 feet of this well due to disruption of the strata, as noted above. Strata below 40 feet bls are dominated by sands and sandstones with minor amounts of clay and some shell beds. These strata most likely represent the Pliocene Tamiami Formation but distinction from the overlying Pleistocene and Holocene units is difficult due to lithologic similarity. These strata generally have poor intergranular porosity.

Peace River Formation of the Hawthorn Group

At the Project site, strata of the Peace River Formation of the Hawthorn Group consist primarily of grayish olive to greenish gray sandy clays that are typically phosphatic, including abundant very fine-to-fine phosphate sand but may include phosphate granules and pebbles as well. Fossiliferous intervals are common and include abundant foraminifers, mollusks, bryozoans, echinoderms, and vertebrates. The top of the Peace River Formation at the Project site is picked at 170 feet bls and the base is picked at 523 feet bls. Strata of the Peace River Formation of the Hawthorn Group range in age from middle Miocene to early Pliocene (Scott, 1988).

Arcadia Formation of the Hawthorn Group

The Acadia Formation of the Hawthorn Group at the Project site consists of approximately 31 feet of limestone, sandstone and clay between 523 and 550 feet bls. This limestone, which can be classified as a mudstone to wackestone (micrite to biomicrite), contains abundant quartz and phosphate sand. Mollusk fossils are common and are preserved as internal and external molds. At the Project site, the unit typically has poor intergranular porosity. The Arcadia Formation has been determined to be of early Oligocene to early Miocene age (Brewster-Wingard, et al. 1998) based upon strontium isotope analyses and mollusk assemblages.

Suwannee Limestone

At the Project site, the Arcadia Formation is underlain by a thin (10 feet) packstone (sparse to packed biomicrite) and trace amounts of dolostone with poor intergranular and intercrystalline porosity from 550 to 560 feet bls. Although most wells logged by the Florida Geological Survey that include this interval show the Ocala Limestone immediately underlying the Hawthorn Group, stratigraphic position and lithologic uniqueness suggests this unit may be equivalent to part of the Suwannee Limestone. However, the limited thickness of this interval and the lack of lithologies typical of the Suwannee Limestone preclude certain assignment of this interval to the Suwannee Limestone. The Suwannee Limestone is generally considered to be of early Oligocene age.

Ocala Limestone

The Ocala Limestone at the Project site is represented by yellowish gray to very pale orange limestones characterized by the presence of the large foraminifer *Lepidocyclina*. The limestones can be classified as packstones to grainstones (packed biomicrites to biosparites) with generally good intergranular porosity. The Ocala Limestone is generally considered to be of late Eocene age and, at the Project site, extends from about 560 to 750 feet bls.

Avon Park Formation

The Ocala Formation is underlain by the Avon Park Formation at the site. The Avon Park Formation consists primarily of very pale orange peloidal packstones to grainstones (packed biopelmicrite to sorted biopelsparite) with generally poor to fair intergranular porosity. The strata of the Avon Park Formation are characterized by the presence of the small echinoid *Neolaganum dalli*. The foraminifer *Lepidocyclina* was also recovered in the cuttings from this interval, but probably represents caved material from the overlying Ocala Limestone, as it was not noted in the video of the open hole. The Avon Park Formation at the site extends from 750 feet bls through the total drilled depth of 890 feet bls and was not completely penetrated by well MW-19. The Avon Park Formation is generally considered to be of middle Eocene age.

4.2 HYDROSTRATIGRAPHY

Radin et. al. (2005) summarized the primary aquifer systems recognized in the lower Kissimmee River Basin. The hydrostratigraphic units encountered at the site of MW-19 include the Surficial Aquifer System, the Intermediate Confining Unit, and the upper part (Upper Floridan Aquifer) of the Floridan Aquifer System. Each of these aquifer systems contains one or more permeable zones that are separated by sediments of lower permeability, which provide varying degrees of confinement.

Surficial Aquifer System (0-170 feet bls)

The Surficial Aquifer System extends from land surface to a depth of approximately 143-feet below land surface. This interval is dominated by sands and sandstones with the latter typically calcitic and often approaching limestone. Shell beds and clay-rich intervals are locally developed. The Surficial Aquifer System is underlain by the clays of the Peace River Formation of the Hawthorn Group.

Intermediate Confining Unit (170-523 feet bls)

The Intermediate Confining Unit consists of the clay-dominated strata of the Peace River Formation of the Hawthorn Group. The clays of the Peace River Formation typically contain appreciable amounts of quartz and phosphate sand, which may locally be developed into sand or sandstone layers. Although these sand-rich intervals may also be water-producing intervals, the bulk of the Peace River Formation has relatively low transmissivity and serves as a confining interval between the overlying Surficial Aquifer System and the underlying Floridan Aquifer System. The Peace River Formation clays are underlain by a relatively thin (27-

feet thick) limestone of the Arcadia Formation which represents the top of the Upper Floridan Aquifer. The total thickness of the Intermediate Confining Unit at the project site is approximately 353 feet.

Upper Floridan Aquifer (541 – 1,000 feet bls+/-)

Miller (1986) grouped the Floridan Aquifer System in south Florida into three units: the Upper Floridan Aquifer, the Middle-Confining Unit, and the Lower Floridan Aquifer. As implied by the names selected, this nomenclature divides the Floridan Aquifer System into upper and lower permeable members that are separated by confining strata. This basic hydrostratigraphic representation of the Floridan Aquifer System has been verified by a number of workers in the region (Radin et al., 2005; Reese & Richardson, 2008) and generally describes conditions that were encountered during drilling at the project site.

The Upper Floridan Aquifer includes all permeable strata in the lower part of the Hawthorn Group, Suwannee Limestone, Ocala Limestone, and the upper Avon Park Formation. Reese and Richardson (2008) suggest that the base of the Avon Park Permeable Zone in the Floridan Aquifer at the Lake Okeechobee ASR well lies at a depth of almost 1,600 feet below land surface.

SECTION 5.0

Results and Conclusions

Monitor Well 19 (MW-19) has been completed with a cased depth of 575 feet bls and an open-hole interval to 880 feet bls. The specific-capacity testing resulted in a calculated specific capacity of approximately 3.45 gpm per foot of drawdown at a production rate of 210 gpm. Water-quality samples were collected for selected Primary and Secondary Drinking Water Standard parameters and analytical results have been included in this report (Subsection 3.3).

SECTION 6.0

References

Brewster-Wingard, G.L., et al., 1997, Reinterpretation of the peninsular Florida Oligocene: An integrated stratigraphic approach: Sedimentary Geology, v. 108, p. 207 -228.

Miller, J. A., 1986, Hydrogeologic framework of the Florida aquifer system in Florida, and in parts of Georgia, Alabama, and South Carolina: U.S. Geological Survey Professional Paper 1403-B, 91 p.

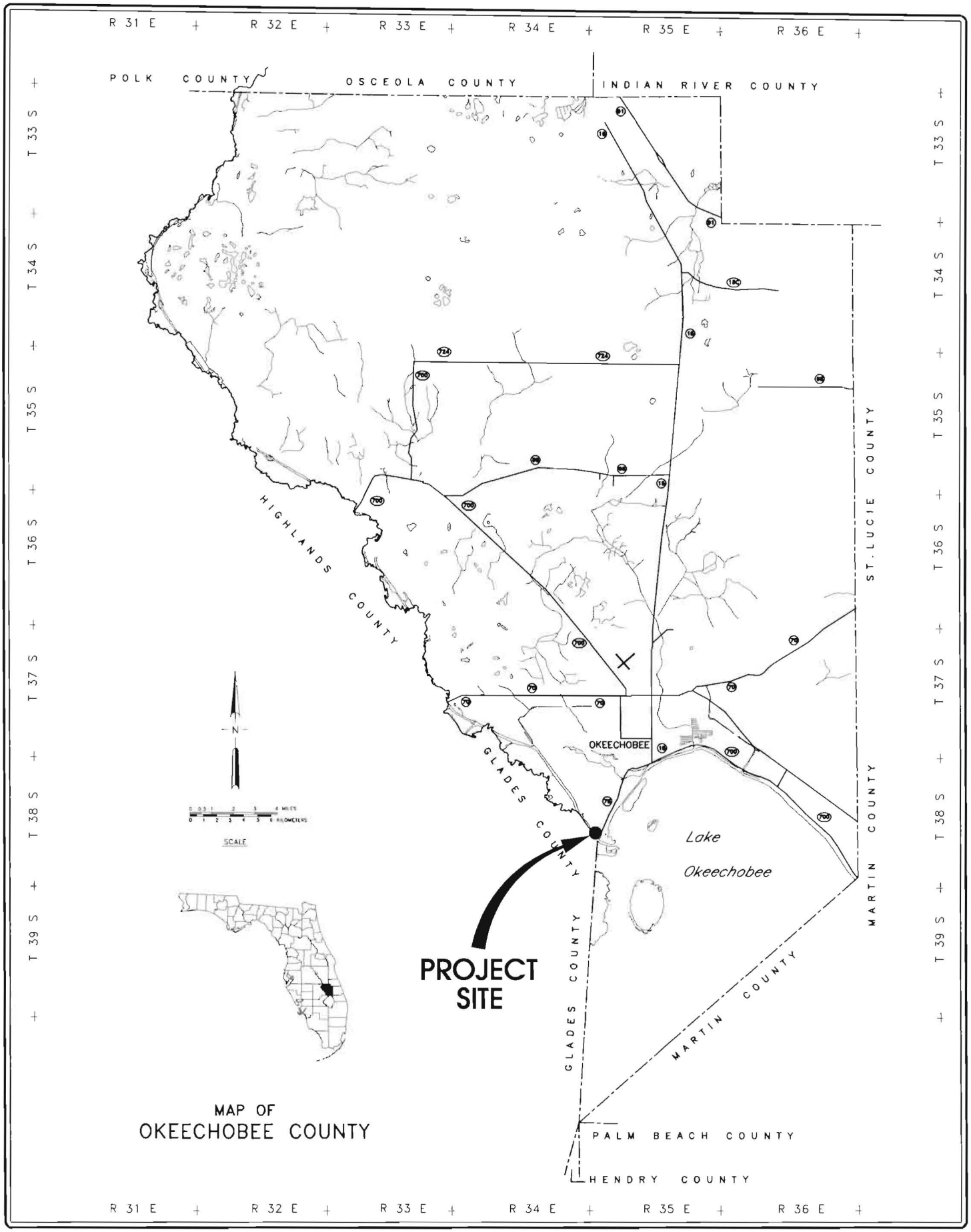
Radin, H. et al, 2005, Lower Kissimmee Basin Groundwater Model: South Florida Water Management District, 200 p.

Reese, R.S., and E. Richardson, 2008, Synthesis of the Hydrogeologic Framework of the Floridan Aquifer System and Delineation of a Major Avon Park Permeable Zone in Central and Southern Florida: U.S. Geological Survey Scientific Investigations Report 2007-5207, 60 p.

Scott, T., 1988, The lithostratigraphy of the Hawthorn Group (Miocene) of Florida: Florida Geological Survey, Bulletin 59, 148 p.

FGS lithologic logs and stratigraphic picks from the following wells were examined: W-50, W-2396, W-2855, W-2857, W-4699, W-4750, W-4896, W-5405, W-5437, W-5438, W-8999, W-15811, W-14062, W-15813, W-15880, W-16579, W-16944, W-17090, W-17091, W-17095, W-18255, W-18726, W-18777,

Figures 1 - 4

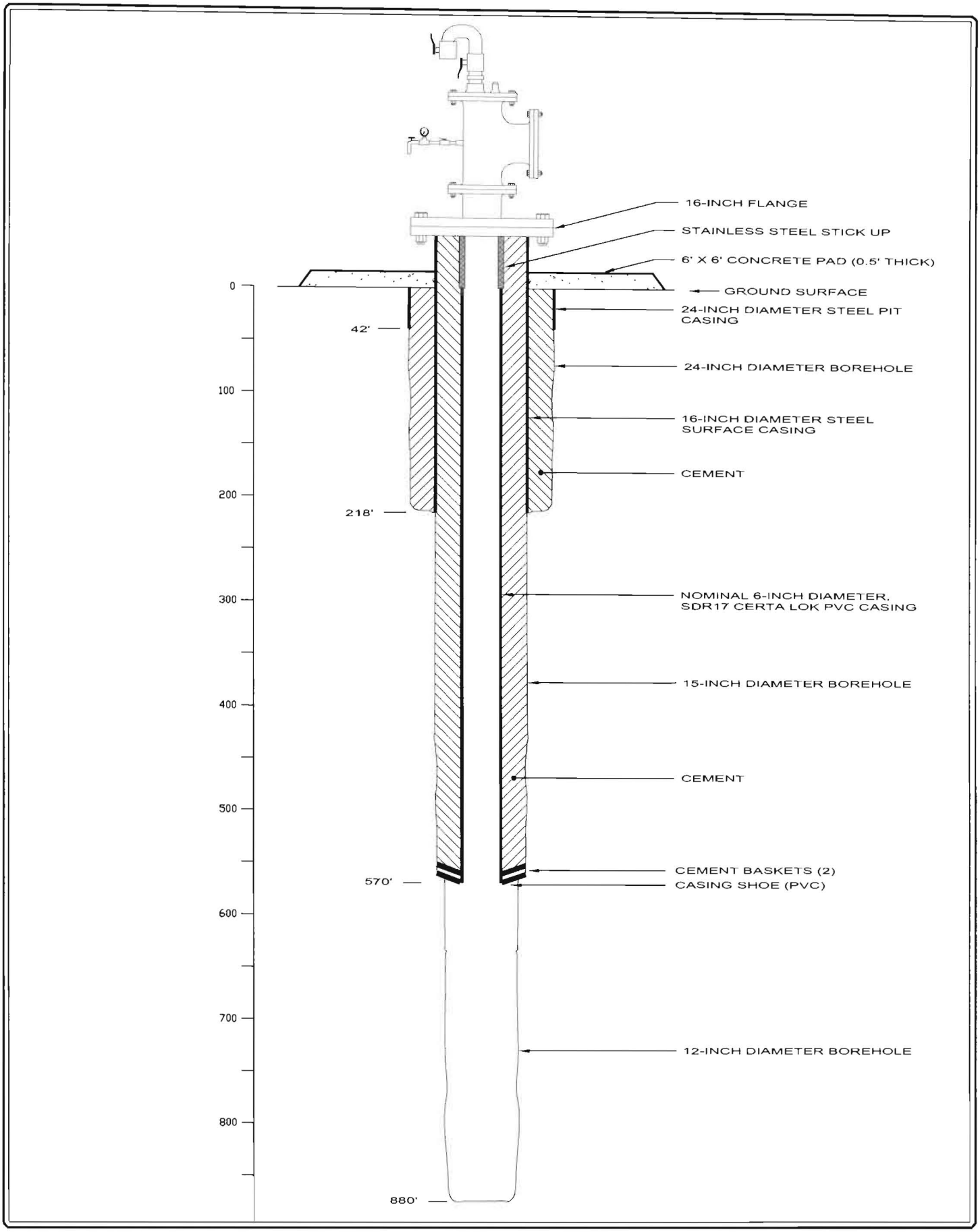


ENTRIX Down to Earth. Down to Business.	PROJECT NAME: KISSIMMEE RIVER ASR FLORIDAN-AQUIFER MONITOR WELL CONSTRUCTION	DWG. NUMBER: 00061012mw1
	PROJECT NUMBER: 00061013	DATE: 02/25/10

FIGURE 1. REGIONAL LOCATION MAP.

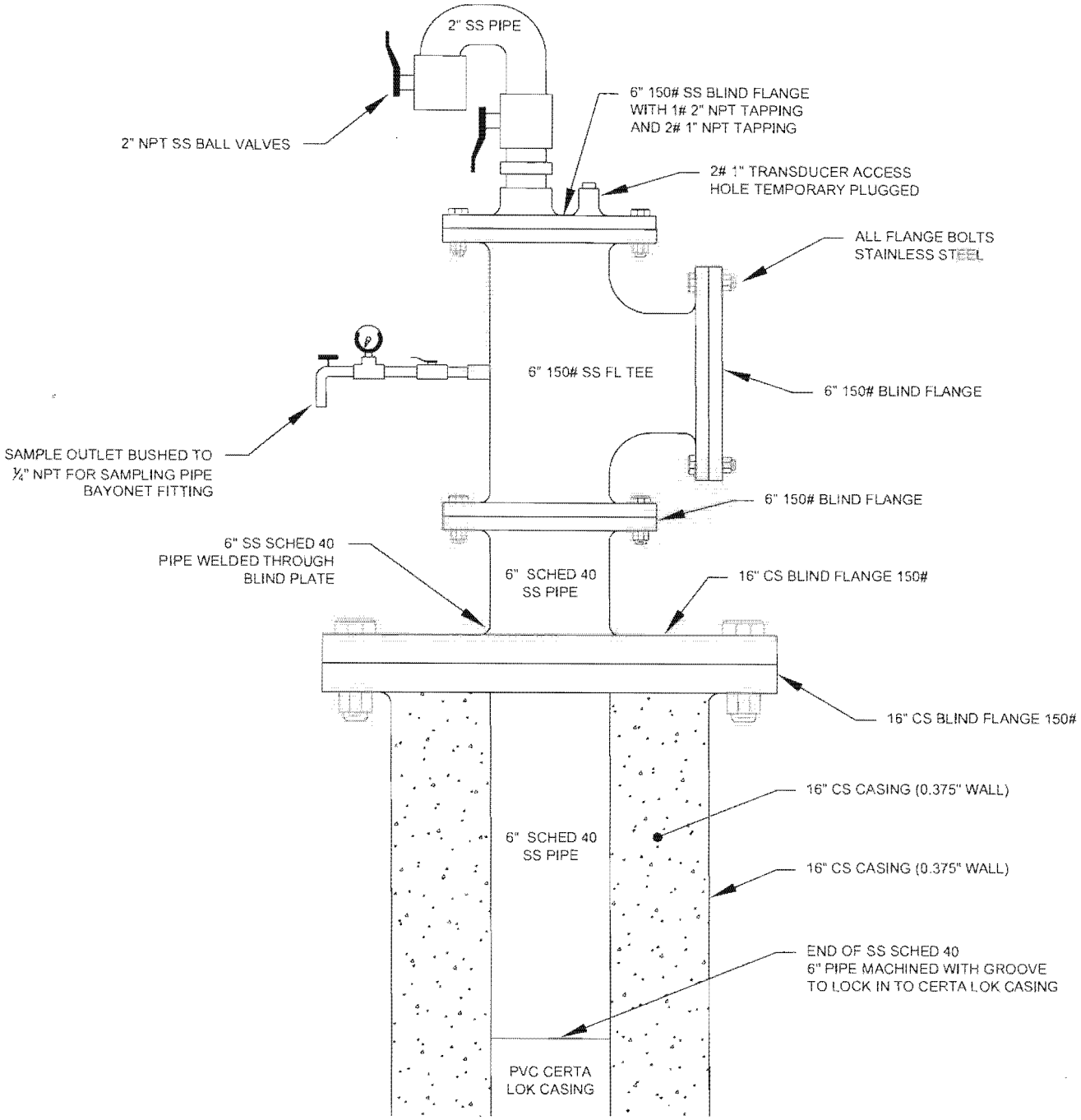
ENTRIX Down to Earth. Down to Business.	PROJECT NAME: KISSIMMEE RIVER ASR FLORIDAN AQUIFER MONITOR WELL CONSTRUCTION	DWG. NUMBER: 00061012mw1
	PROJECT NUMBER: 00061013	DATE: 11/16/09

FIGURE 2. SITE MAP.



ENTRIX Down to Earth. Down to Business.	PROJECT NAME: ACOE KISSIMMEE RIVER ASR	DWG. NUMBER: 00061012mw1
	PROJECT NUMBER: 00061013	DATE: 02/25/10

FIGURE 3. MONITOR WELL MW-19 WELL CONSTRUCTION DIAGRAM,



NOTE:

1. ALL SS GRADE 304
2. ALL PIPEWORK IN CONTACT WITH WATER TO BE STAINLESS STEEL

ENTRIX	PROJECT NAME: ACOE KISSIMMEE RIVER ASR	DWG. NUMBER: 00061012mw1
	PROJECT NUMBER: 00061013	DATE: 02/17/10

FIGURE 4. MONITOR WELL MW-19 WELLHEAD CONSTRUCTION DETAIL.

APPENDIX 1.0.1

Well Construction Permit

10-07-09;11:15AM;

PAID

SEP 29 2009

Okeechobee Co. Health Dept.

STATE OF FLORIDA PERMIT APPLICATION TO CONSTRUCT, REPAIR, MODIFY, OR ABANDON A WELL.

☐ Southwest
☐ Northwest
☐ St. Johns River
☐ South Florida
☐ Suwannee River

THIS FORM *MUST* BE FILLED OUT COMPLETELY.
The water well contractor is responsible for completing this form and forwarding the permit to the appropriate delegated county where applicable.

CHECK BOX FOR APPROPRIATE DISTRICT; ADDRESS ON BACK OF PERMIT FORM.

Permit No. 47-59-02254
Florida Unique I.D. _____
Permit Stipulations Required (See attached)
_____
62-524 well ☐
SWF Application No. _____

ABOVE THIS LINE FOR OFFICIAL USE ONLY

1. US ARMY CORPS OF ENGINEERS 701 SAN MARCO BLVD JACKSONVILLE FL32207 904 232 1236
Owner, Legal Name of Entity if Corporation — Address — City — Zip — Telephone Number

2. SW 99th DRIVE, OKEECHOBEE FL 34974
Well Location — Address, Road Name or Number, City

3. KEITH MYERS 7357 407 654 6970
Well Drilling Contractor — License No. — Telephone No.

4. 10301 CROWN PARK CIRCLE
Address

WINTER GARDEN FL 34787
City — State — Zip

4. SE (primary) 1/4 of NE (suppl.) 1/4 of Section 13
(Indicate Well on Chart)

NW NE
X
SW SE

5. Township 38S Range 34E

6. Okeechobee
County — Subdivision Name — Lot — Block — Unit

7. Number of proposed wells 1 Check the use of well: (See back of permit for additional choices) _____ Domestic Monitor (type) MONITOR WELL ASR MW-19
_____ Irrigation (type) (See back) Public Water Supply (type) _____ (See Back) List Other _____
Distance from septic system 200 ft. Description of facility _____ Estimated start of construction date 8th Oct 09

8. Application for: ✓ New Construction _____ Repair/Modify _____ Abandonment _____ (Reason for Abandonment)

Date Stamp

9. Estimated: Well Depth 890' Casing Depth 575' Screen Interval from ____ to ____
Casing Material: ~~Black Steel~~ / PVC Casing Diameter 6" Seal Material _____

10. If applicable: Proposed Grouting Interval From 0 to 40' Seal Material Neat Cement
From 0 to 215' Seal Material Cement 3% Gel
From 0 to 575' Seal Material Cement 3% Gel

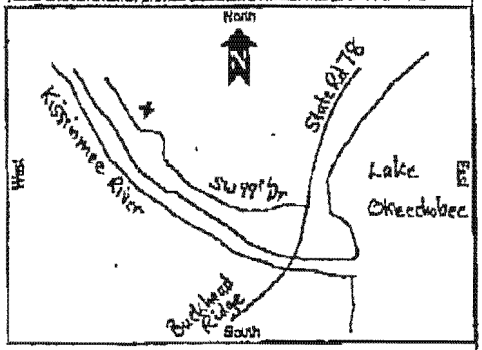
11. Telescope Casing ____ or Liner ____ (check one) Diameter _____
~~Blk-Steel~~ / Galvanized / PVC Other (specify): _____

12. Method of Construction: ✓ Rotary ____ Cable Tool ____ Combination
____ Auger ____ Other (specify) _____)

13. Indicate total No. of wells on site 1 List number of unused wells on site ____

14. Is this well or any other well or water withdrawal on the owner's contiguous property covered under a Consumptive/Water Use Permit (CUP/WUP) or CUP/WUP Application? ___No ___Yes
(If yes, complete the following) CUP/WUP No. Kissimmee River ASR
District well I.D. No. _____
Latitude 27° 9' 53.53" Longitude 80° 52' 53.80"
Data obtained from GPS ✓ or map ____ or survey ____ (map datum NAD 27 ____ NAD 83 ____)

Draw a map of well location and indicate well site with an "X". Identify known roads and landmarks; provide distances between well and landmarks.



15. I hereby certify that I will comply with the applicable rules of Title 40, Florida Administrative Code, and that a water use permit or artificial recharge permit, if required, has been or will be obtained prior to commencement of well construction. I further certify that all information provided on this application is accurate and that I will obtain necessary approval from other federal, state, or local governments, if applicable. I agree to provide a well completion report to the District within 30 days after drilling or the permit expiration, whichever occurs first.

Signature of Contractor — License No. — Date

I certify that I am the owner of the property, that the information provided is accurate, and that I am aware of my responsibilities as under Chapter 373, Fla. Stat., to maintain or properly abandon this well; or, I certify that I am the agent for the owner, that the information provided is accurate, and that I have informed the owner of his responsibilities as stated above. Owner consents to personnel of the WMD or a representative access to the well site.

Owner or Agent Signature — 29th Sept 09 Date

DO NOT WRITE BELOW THIS LINE — FOR OFFICIAL USE ONLY

Approval Granted By: Vicki Hollard — Issue Date: 9-29-9 — Hydrologist Approval _____ Initials

Owner Number: _____ Fee Received: $ 100- — Receipt No.: _____ — Check No.: C.C.

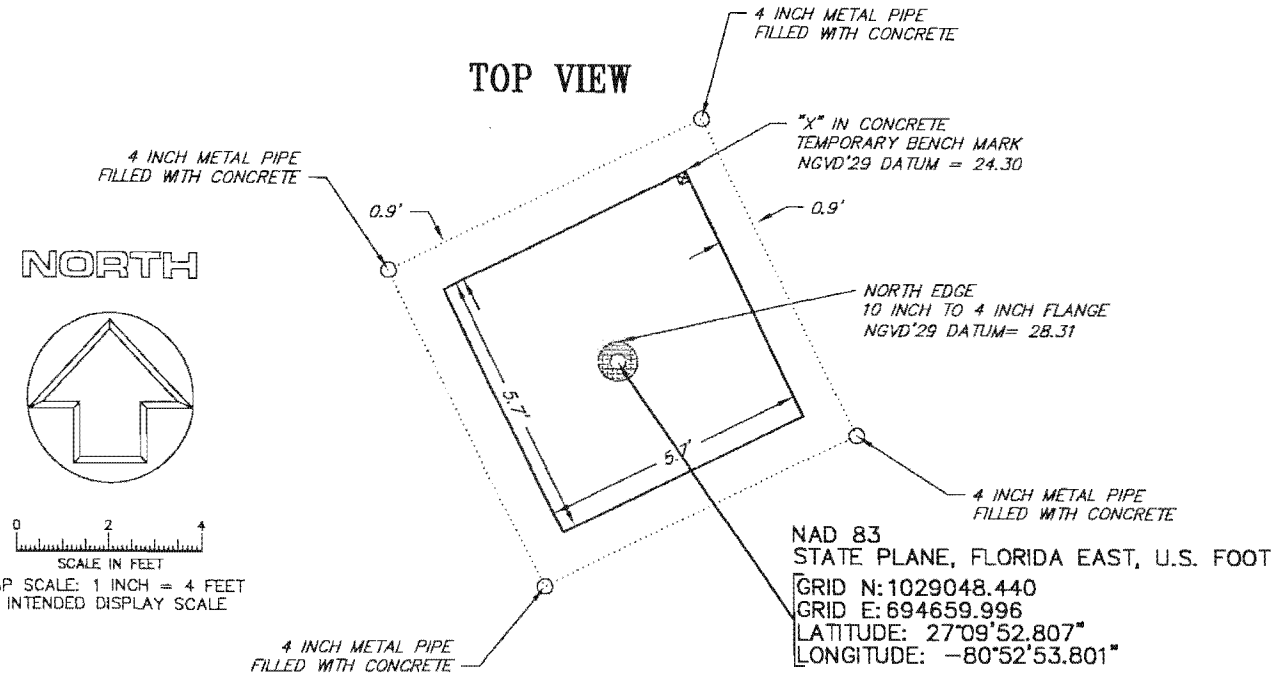
Enter numerical month, day and full, four-digit year.

THIS PERMIT NOT VALID UNTIL PROPERLY SIGNED BY AN AUTHORIZED OFFICER OR REPRESENTATIVE OF THE WMD. IT SHALL BE AVAILABLE AT THE WELL SITE DURING ALL DRILLING OPERATIONS. *This permit is valid for 90 days from date of issue.*

APPENDIX 1.0.2

As-Built GPS Well Location Report

TOP VIEW

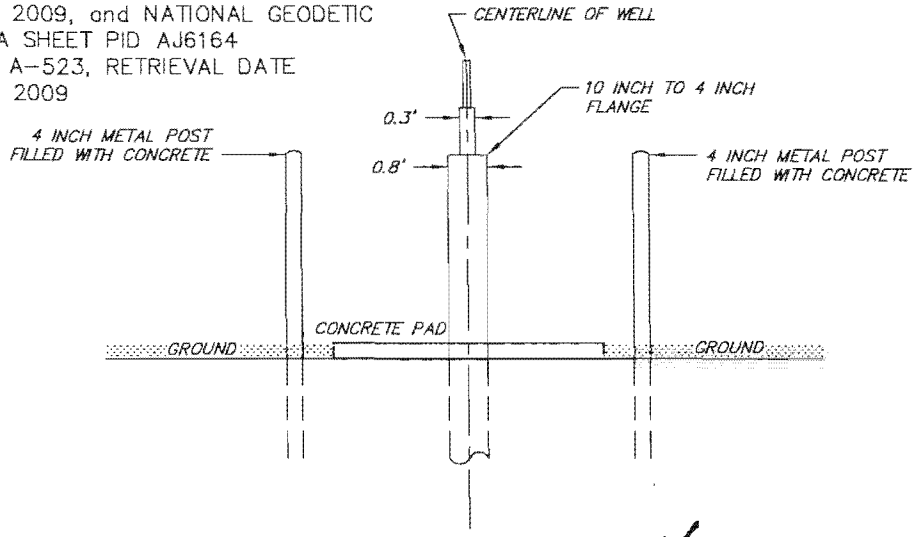


WELL SITE MW 19

PROJECT SPECIFIC NOTES:

ELEVATIONS SHOWN HEREON ARE BASED ON THE NATIONAL GODEDIC VERTICAL DATUM, 1929 ADJUSTMENT (NGVD) '29. REFERENCE BENCH MARK USED: NATIONAL GEODETIC SURVEY DATA SHEET PID AJ6168 DESIGNATION E-523, RETRIEVAL DATE OCTOBER 14, 2009, and NATIONAL GEODETIC SURVEY DATA SHEET PID AJ6164 DESIGNATION A-523, RETRIEVAL DATE OCTOBER 15, 2009

SIDE VIEW



Kenneth A. Breaux, Jr. (PSM 4820)

AS BUILT GPS WELL LOCATION REPORT

PREPARED FOR: **DIVERSIFIED DRILLING CORP.**

DESCRIPTION	DRAWING DATE	BY	CK
PREPARE REPORT SKETCH	FEBRUARY 11, 2010	RLC	KAB
FB/PG: 236/28-29	SCALE: 1"=4'		
FILE: 23242	JOB NO: 23242		

TRADEWINDS
SURVEYORS AND MAPPERS, INC.
200 SW 3rd Avenue
Okeechobee, FL 34974
Tel: (863) 763-2887
Fax: (863) 763-4342
Email: twps@embarqmail.com

Tally for 16-inch Diameter Surface Casing

ENTRIX
Down to Earth. Down to Business.℠

Date: 12/7/2009
Project Name: ASR Floridan Aquifer Monitor Well Construction
Job No.: 00061013.00
Prepared By: K. Cheney

Casing Tally Form

Well No.: MW-19

Casing Outside Diameter (in.): 16
Casing wall thickness (inches): 0.375
Casing material: A53/5L Mild Carbon Steel

Piece #	Length (ft)	Total Length (ft)	Heat #
1	7.37	7.37	Individual heat numbers not
2*	42.08	49.45	discernable -
3	42.07	91.52	refer to mill certificates
4*	42.08	133.60	previously submitted.
5	42.07	175.67	
6	42.00	217.67	

* = centralizer placement.

APPENDIX 2.4.2

Cementing Report for 16-inch Diameter Surface Casing

DIVERSIFIED DRILLING CORPORATION

CEMENTING REPORT

PROJECT: KISSIMMEE RIVER MONITOR WELLS
DATE: 12/7/2009
JOB # 70905
WELL # #19
COUNTY: OKEECHOBEE
CUSTOMER REP: DAVE, KAREN

CEMENTING CREW

MAGNUS ORAKWE

DRILLER:

ROSS A.

OPERATION SEQUENCE:

PRE-FLUSH 2 BBL
MIX BENTONITE IF NEEDED
MIX CEMENT TO SPECIFIED DENSITY
PUMP CEMENT

COLLAPSE STRENGTH:

16" STEEL CASING

CASING TYPE:
16" STEEL CASING

ACCTUAL VOLUME PUMPED:

CMT:	59.4 BBL
CMT HT:	118 FT
CUFT:	333.5 CUFT
GAL:	2494.8 GAL
SKS	224 SKS
LEAD DENSITY:	14.5 LBS/GAL
HOLE ID:	18.75 INCH
CASING OD:	16 INCH
CASING ID:	15.25 INCH
CASING HT:	220.67 FT
CASING WALL:	0.375 INCH
SLURRY VOLUME:	1.49 CUFT/SK
TUBING ID:	2.4 INCH
TUBING HT:	187.33 FT
CASING DIS:	33.29 FT

EQUIPMENT ON SITE:

PUMP TRUCK	242
TRACTOR	661
TRAILER	187

DISPLACEMENT:

8.568745 BBL
359.8873 GAL

ADDITIVES:

% BENTONITE:	3

ACCTUAL VOLUME PUMPED:

CMT:	35 BBL
CMT HT:	100 FT

EQUIPMENT ON SITE:

CUFT:	196.511 CUFT
GAL:	1470 GAL
SKS	167 SKS
LEAD DENSITY:	15.6 LBS/GAL
HOLE ID:	23 INCH
CASING OD:	16 INCH
CASING ID:	15.25 INCH
CASING HT:	220.67 FT
CASING WALL:	0.375 INCH
SLURRY VOLUME:	1.18 CUFT/SK
TUBING ID:	2.4 INCH
TUBING HT:	187.33 FT
CASING DIS:	33.29 FT

TAGGED 15FT

PUMP TRUCK	242
TRACTOR	661
TRAILER	187

DISPLACEMENT:

8.568745 BBL	
359.8873 GAL	

ADDITIVES:

% BENTONITE:	0

ACCTUAL VOLUME PUMPED: DATE 12/08/09

CMT:	3.2 BBL
CMT HT:	15 FT
CUFT:	17.97 CUFT
GAL:	134.4 GAL
SKS	15 SKS
LEAD DENSITY:	15.6 LBS/GAL
HOLE ID:	23 INCH
CASING OD:	16 INCH
CASING ID:	15.25 INCH
CASING HT:	220.67 FT
CASING WALL:	0.375 INCH
SLURRY VOLUME:	1.18 CUFT/SK
TUBING ID:	2 INCH
TUBING HT:	16 FT
CASING DIS:	0 FT

EQUIPMENT ON SITE:

PUMP TRUCK	242
TRACTOR	661
TRAILER	187

DISPLACEMENT:

0.06217 BBL	
2.611123 GAL	

ADDITIVES:

% BENTONITE:	0

TORAL SKS 406

APPENDIX 2.5.1

Tally for 6-inch Diameter Final Casing

ENTRIX

Down to Earth. Down to Business.™

Date: 12/22/2009

Project Name: ASR Floridan Aquifer Monitor Well Construction

Job No.: 00061013.00

Prepared By: Donald J. Lee, P.G.

Well No.: MW-19

Casing Tally Form

Casing Diameter (in.): CertainTeed 6"

Casing material: SDR 17 Certa-Lok 1B Well Casing ASTM F480

Piece #	Length (ft)	Total Length (ft)
1*	10.00	10.00
2	20.00	30.00
3	20.00	50.00
4**	20.00	70.00
5	20.00	90.00
6**	20.00	110.00
7	20.00	130.00
8	20.00	150.00
9	20.00	170.00
10	20.00	190.00
11**	20.00	210.00
12	20.00	230.00
13	20.00	250.00
14	20.00	270.00
15	20.00	290.00
16**	20.00	310.00
17	20.00	330.00
18	20.00	350.00
19	20.00	370.00
20	20.00	390.00
21**	20.00	410.00
22	20.00	430.00
23	20.00	450.00
24	20.00	470.00
25	20.00	490.00
26**	20.00	510.00
27	20.00	530.00
28	20.00	550.00
29	20.00	570.00

*Cement baskets installed at base.

**centralizer placement.

APPENDIX 2.5.2

Cementing Report for 6-inch Diameter Final Casing

DIVERSIFIED DRILLING CORPORATION

CEMENTING REPORT

PROJECT: KISSIMMEE RIVER MONITOR WELLS
DATE: 12/22/2009
JOB # 70905
WELL # #19
COUNTY: OKEECHOBEE
CUSTOMER REP:

CEMENTING CREW

MAGNUS ORAKWE

DRILLER:

ROSS A.

OPERATION SEQUENCE:

PRE-FLUSH 1BBL
MIX BENTONITE IF NEEDED
MIX CEMENT TO SPECIFIED DENSITY
PUMP CEMENT

COLLAPSE STRENGTH:

	0 PSI
PVC CASING	224 PSI

CASING TYPE:
PVC

VOLUME :

	1 SHOT
CMT:	1.33 BBL
LIFT	0 FT
CUFT:	7.5 CUFT
GAL:	55.86 GAL
SKS	5.0 SKS
LEAD DENSITY:	14.5 LBS/GAL
HOLE ID:	15 INCH
CASING OD:	6 INCH
CASING ID:	5.22 INCH
CASING HT:	570 FT
CASING WALL:	0.39 INCH
SLURRY VOLUME:	1.49 CUFT/SK
TUBING ID:	1.25 INCH
TUBING HT:	558 FT
CASING DIS:	0 FT

EQUIPMENT ON SITE:

PUMP TRUCK	242
TRACTOR	661
MUD WEIGHT	9 LBS/GAL

PRESSURE ON CASING:

PRESURE DUE TO CMT	0 PSI
PRESURE DUE TO TEMP	111.96 PSI
TOTAL PRESSURE	111.96 PSI

F.S 2.000715

DISPLACEMENT:

0.846939 BBL	
35.57145 GAL	

ADDITIVES:

% BENTONITE:	3
TAG ±FT	

	2ND SHOT
CMT:	1.33 BBL

12/22/2009

LIFT	18 FT
CUFT:	7.5 CUFT
GAL:	55.86 GAL
SKS	5.0 SKS
LEAD DENSITY:	14.5 LBS/GAL
HOLE ID:	15 INCH
CASING OD:	6 INCH
CASING ID:	5.22 INCH
CASING HT:	570 FT
CASING WALL:	0.39 INCH
SLURRY VOLUME:	1.49 CUFT/SK
TUBING ID:	1.25 INCH
TUBING HT:	558 FT
CASING DIS:	0 FT

MUD WEIGHT 9 LBS/GAL

PRESSURE ON CASING:

PRESURE DUE TO CMT	5.148 PSI
PRESURE DUE TO TEMP	111.96 PSI
TOTAL PRESSURE	117.108 PSI

F.S 1.912764

DISPLACEMENT:

0.1846939 BBL
35.57145 GAL

ADDITIVES:

% BENTONITE: 3

TAG 552 FT

3RD SHOT

CMT:	18 BBL
LIFT	75 FT
CUFT:	101.1 CUFT
GAL:	756 GAL
SKS	85.6 SKS
LEAD DENSITY:	15.6 LBS/GAL
HOLE ID:	15 INCH
CASING OD:	6 INCH
CASING ID:	5.22 INCH
CASING HT:	570 FT
CASING WALL:	0.39 INCH
SLURRY VOLUME:	1.18 CUFT/SK
TUBING ID:	1.25 INCH
TUBING HT:	542 FT
CASING DIS:	0 FT

11/23/2009

MUD WEIGHT 9 LBS/GAL

PRESSURE ON CASING:

PRESURE DUE TO CMT	25.74 PSI
PRESURE DUE TO TEMP	111.96 PSI
TOTAL PRESSURE	137.7 PSI

F.S 1.626725

DISPLACEMENT:

0.822654 BBL
34.55148 GAL

ADDITIVES:

% BENTONITE: 0

TAG 475 FT

4TH SHOT

CMT:	43 BBL
LIFT	150 FT
CUFT:	241.4 CUFT
GAL:	1806 GAL
SKS	162.0 SKS
LEAD DENSITY:	14.5 LBS/GAL
HOLE ID:	15 INCH
CASING OD:	6 INCH
CASING ID:	5.22 INCH
CASING HT:	570 FT
CASING WALL:	0.39 INCH

11/23/2009

MUD WEIGHT 9 LBS/GAL

PRESSURE ON CASING:

PRESURE DUE TO CMT	42.9 PSI
PRESURE DUE TO TEMP	111.96 PSI
TOTAL PRESSURE	154.86 PSI

SLURRY VOLUME:	1.49 CUFT/SK
TUBING ID:	1.25 INCH
TUBING HT:	470 FT
CASING DIS:	0 FT
ADDITIVES:	
% BENTONITE:	3
TAG 330 FT	

F.S 1.446468

DISPLACEMENT:

0.743372 BBL
29.96162 GAL

5TH SHOT

CMT:	29 BBL
LIFT	315 FT
CUFT:	162.8 CUFT
GAL:	1218 GAL
SKS	109.3 SKS
LEAD DENSITY:	14.5 LBS/GAL
HOLE ID:	15 INCH
CASING OD:	6 INCH
CASING ID:	5.22 INCH
CASING HT:	218 FT
CASING WALL:	0.39 INCH
SLURRY VOLUME:	1.49 CUFT/SK
TUBING ID:	1.25 INCH
TUBING HT:	327 FT
CASING DIS:	0 FT
ADDITIVES:	
% BENTONITE:	3
TAG 15 FT	

11/24/2009

MUD WEIGHT 9 LBS/GAL

PRESSURE ON CASING:

PRESURE DUE TO CMT	90.09 PSI
PRESURE DUE TO TEMP	111.96 PSI
TOTAL PRESSURE	202.05 PSI

F.S 1.108636

DISPLACEMENT:

0.496325 BBL
20.84564 GAL

6TH SHOT

CMT:	3.2 BBL
LIFT	315 FT
CUFT:	18.0 CUFT
GAL:	134.4 GAL
SKS	15.2 SKS
LEAD DENSITY:	15.6 LBS/GAL
HOLE ID:	15 INCH
CASING OD:	6 INCH
CASING ID:	5.22 INCH
CASING HT:	218 FT
CASING WALL:	0.39 INCH
SLURRY VOLUME:	1.18 CUFT/SK
TUBING ID:	1.25 INCH
TUBING HT:	327 FT
CASING DIS:	0 FT
ADDITIVES:	
% BENTONITE:	0

12/28/2009

MUD WEIGHT 9 LBS/GAL

PRESSURE ON CASING:

PRESURE DUE TO CMT	108.108 PSI
PRESURE DUE TO TEMP	111.96 PSI
TOTAL PRESSURE	220.068 PSI

F.S 1.017867

DISPLACEMENT:

0.496325 BBL
20.84564 GAL

TOTAL SACKS 382.2

APPENDIX 2.7.1

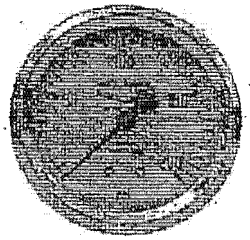
Specification Sheet for Wellhead Pressure Gauge

Liquid Filled Stainless Case Gauges

- copper alloy bourdon tube
- white aluminum dial with black numbers and black aluminum pointer
- PowerFlex™ movement with polyester segment designed to resist the effects of shock, vibration and pulsation.
- ¼" NPT brass connection
- glycerin liquid fill
- polycarbonate window
- ambient temperature range -4°F to 140°F
- ASME B40.1, Grade B (± 2-1-2% accuracy)

2½" face
¼" center back mount

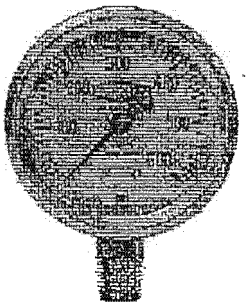
PSI	Fig. Inter.	Minor Grad.	Part #	Price/E
0-15	1	.5	GLSC400	$47.70
0-30	5	.5	GLSC405	47.70
0-60	5	1	GLSC410	47.70
0-100	10	2	GLSC415	47.70
0-160	20	5	GLSC417	47.70
0-200	20	5	GLSC420	47.70
0-300	30	5	GLSC425	47.70
0-400	50	10	GLSC427	47.70
0-600	50	10	GLSC430	47.70
0-1000	200	20	GLSC435	47.70
0-1500	300	50	GLSC440	54.10
0-2000	400	50	GLSC445	54.10
0-3000	500	100	GLSC450	54.10
0-5000	1000	100	GLSC455	54.10



GLSC420

2½" face
¼" lower mount

PSI	Fig. Inter.	Minor Grad.	Part #	Price/E
0-15	1	.5	GLS400	$39.25
0-30	5	.5	GLS405	39.25
0-60	5	1	GLS410	39.25
0-100	10	2	GLS415	39.25
0-160	20	5	GLS417	39.25
0-200	20	5	GLS420	39.25
0-300	30	5	GLS425	39.25
0-400	50	10	GLS427	39.25
0-600	50	10	GLS430	39.25
0-1000	200	20	GLS435	43.50
0-1500	300	50	GLS440	43.50
0-2000	400	50	GLS445	43.50
0-3000	500	100	GLS450	43.50
0-5000	1000	100	GLS455	43.50

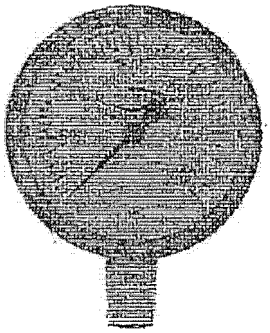


GLS430

Liquid Filled ABS Case Gauges

2½" face
¼" lower mount

PSI	Fig. Inter.	Minor Grad.	Part #	Price/E
0-15	1	.5	GLP500	$30.75
0-30	5	.5	GLP505	30.75
0-60	5	1	GLP510	30.75
0-100	10	2	GLP515	30.75
0-160	20	5	GLP517	30.75
0-200	20	5	GLP520	30.75
0-300	30	5	GLP525	30.75
0-400	50	10	GLP527	30.75
0-600	50	10	GLP530	30.75
0-1000	200	20	GLP535	35.00
0-1500	300	50	GLP540	35.00
0-2000	400	50	GLP545	35.00
0-3000	500	100	GLP550	35.00
0-5000	1000	100	GLP555	35.00



GLP550

APPENDIX 3.1

Mechanical Integrity Test Results

ENTRIX

Down to Earth. Down to Business.

Casing Pressure Test Log

Date: 1/5/2010
Project Name: Kissimmee River ASR Floridan Aquifer
Job No.: 00061013.00 F001
Prepared By: Donald J. Lee, P.G.

Well(s) MW-19

Time	Delta T (min)	Casing Pressure (psi)	Pressure Change (psi)	Percent Change
9:09	0	50.00	0.00	0.0
9:14	5	49.80	0.20	0.4
9:19	10	49.70	0.10	0.6
9:24	15	49.50	0.20	1.0
9:29	20	49.30	0.20	1.4
9:34	25	49.10	0.20	1.8
9:39	30	48.90	0.20	2.2
9:44	35	48.75	0.15	2.5
9:49	40	48.60	0.15	2.8
9:54	45	48.40	0.20	3.2
9:59	50	48.25	0.15	3.5
10:04	55	48.10	0.15	3.8
10:09	60	47.90	0.20	4.2

Casing Diameter: 5.85 inch
Casing Type: Certa-Lok PVC SDR 17

Depth Center Line of Packer: 563 feet
Center Line of Packer: 4.81 feet
Packer Length: 8.07 feet
Gauge SN/ID #: 120905
Calibration Date: 11/24/2009

5% of Initial Casing Pressure: 2.5 psi
Total Pressure Change: 2.1 psi

Witnesses: Donald Lee P.G. 1-5-2010
(ENTRIX)

APPENDIX 3.2

Specific Capacity Test Results

ENTRIX

Down to Earth. Down to Business.™

Date: 1/6/2010

Project Name: ASR Floridan Aquifer Monitor Well Construction

Project No.: 00061013.00

Prepared By: Donald J. Lee, P.G. (DJL)

Specific-Capacity Testing

Initial Pressure: 9.2

Static Level 20.50 feet above top of casing

Discharge Rate (Q): 210 gpm

Well: MW-19

Elapsed Time (hr:min)	Water Level (feet btoc)	Total Drawdown (feet below static)	Specific Capacity (gpm/ft)
0:05	34.60	60.01	3.50
0:10	34.95	60.36	3.48
0:14	35.09	60.50	3.47
0:20	35.15	60.56	3.47
0:25	35.25	60.66	3.46
0:41	35.39	60.80	3.45
0:59	35.48	60.89	3.45
1:08	35.50	60.91	3.45
1:21	35.58	60.99	3.44
1:43	35.48	60.89	3.45
1:50	35.45	60.86	3.45
1:55	35.45	60.86	3.45
2:02	35.43	60.84	3.45
2:15	35.43	60.84	3.45

APPENDIX 3.3

Water Quality Laboratory Analysis Results

Jupiter
Environmental Laboratories, Inc.

www.jupiterlabs.com
150 S. Old Dixie Highway, Jupiter, FL 33458
(561) 575-0030 • FAX (561) 575-4118 • clientservices@jupiterlabs.com

J.E.L. Log # 1024347
P.O. # _____
Quote # _____

Company Name ENTRIX, INC.
Address 1035 State Road 7 STE 315-10
City Wellington State FL Zip 33414
Sampling Site Address Kissimmee River ASR
Attn: Mike Waldron Email mwaldon@entrix.com
Project Name KASR Project # 000610\2.00 K001 / 000610\3.00 K801
Sampler Name/Signature DONALD J. LEE, P.G. Donald J. Lee / KAREN L. CHENEY, P.G. Karen L. Cheney

LAB ANALYSIS

#	Sample Label (Client ID)	Collected Date	Collected Time	Matrix Code*	# of Cont	Pres Codes	Parameters: Metals (1)	Alkalinity	TDS	Sulfide (Dissolved)	Ion Chromatography *	Gross Alpha	Field Filtered (Y/N)	Comments
1	MW-19	01.06.10	13:35	GW	7		1	1	1	2	1	1		* Br, Cl, F, NO_3,
2	MW-18	01.06.10	1835	GW	7		1	1	1	2	1	1		NO_2, PO_4, SO_4
3														
4														send electronic
5														rept. to:
6														kchenev@entrix.com
7														Al, Sb, As, Ba, Be (1) KB
8														Cd, Ca, Cr, Co, Cu
9														Fe, Pb, Mg, Mn, Ni, K
10														Se, Ag, Na, Tl, V, Zn

Requested Turnaround Time
Note: Rush requests subject to acceptance by the laboratory
✓ Standard
___ Expedited
Due ___/___/___

Matrix Codes*
S Soil/Solid Sediment; GW Ground Water; WW Waste Water; DW Drinking Water; SW Surface Water; SL Sludge; O Other (Please Specify)

Pres Codes
A- none; B- HNO_3; C- H_2SO_4; D- NaOH; E- HCl; I- Ice; O- Other; M- MeOH; N- $Na_2S_2O_3$; Z- ZnAc

Relinquished by	Date	Time	Received by	Date	Time
Donald Lee	01.07.10	1445	Karla Pabon	1/7/10	1445

QA/QC level with report
None ___ 1 ✓ 2 ___ 3 ___ See price guide for applicable fees

FDEP 2007 ☐ FDEP 2008 ☐ FDEP 2009 ☐
SFWMD ☐ GSA ☐ DOT ☐ USACOE ☑

Temp Control: 4 °C

24347

Jupiter
Environmental Laboratories, Inc.

Jupiter Environmental Laboratories, Inc.
150 S. Old Dixie Highway
Jupiter, FL 33458
Phone: (561)575-0030
Fax (561)575-4118
www.jupiterlabs.com
clientservices@jupiterlabs.com

January 27, 2010

Mike Waldron
Entrix Water Solutions
1035 S. State Rd. 7 Ste 315-20
West Palm Beach, FL 33414

RE: LOG# 1024347
Project ID: KASR
COC# 24347

Dear Mike Waldron:

Enclosed are the analytical results for sample(s) received by the laboratory on Thursday, January 07, 2010. Results reported herein conform to the most current NELAC standards, where applicable, unless indicated by * in the body of the report.

The enclosed Chain of Custody is a component of this package and should be retained with the package and incorporated therein.

Results for all solid matrices are reported in dry weight unless otherwise noted. Results for all liquid matrices are reported as received in the laboratory unless otherwise noted.

Samples are disposed of after 30 days of their receipt by the laboratory unless archiving is requested in writing. The laboratory maintains the right to charge storage fees for archived samples.

Certain analyses are subcontracted to outside NELAC certified laboratories, please see the Footnotes section of this report for NELAC certification numbers of laboratories used.

A Statement of Qualifiers is available upon request.

If you have any questions concerning this report, please feel free to contact me.

Sincerely,

Ann McKewin for
Kacia Baldwin
V.P. of Operations

Enclosures

FDOH# E86546

CERTIFICATE OF ANALYSIS

nelac

Jupiter
Environmental Laboratories, Inc.

Jupiter Environmental Laboratories, Inc.
150 S Old Dixie Highway
Jupiter, FL 33458
Phone: (561)575-0030
Fax: (561)575-4118

SAMPLE ANALYTE COUNT

LOG# 1024347
Project ID: KASR

Lab ID	Sample ID	Method	Analytes Reported
1024347001	MW-19	EPA 200.8 (Total)	22
		EPA 310.2	1
		EPA 900.0	1
		SM 2540C	1
1024347002	MW-18	EPA 200.8 (Total)	22
		EPA 310.2	1
		EPA 900.0	1
		SM 2540C	1

Jupiter
Environmental Laboratories, Inc.

Jupiter Environmental Laboratories, Inc.
150 S. Old Dixie Highway
Jupiter, FL 33458
Phone: (561)575-0030
Fax: (561)575-4118

SAMPLE SUMMARY

LOG# 1024347
Project ID: KASR

Lab ID	Sample ID	Matrix	Date Collected	Date Received
1024347001	MW-19	Aqueous Liquid	1/6/2010 13:35	1/7/2010 14:45
1024347002	MW-18	Aqueous Liquid	1/6/2010 18:35	1/7/2010 14:45

Jupiter
Environmental Laboratories, Inc.

Jupiter Environmental Laboratories, Inc.
150 S. Old Dixie Highway
Jupiter, FL 33458
Phone: (561)575-0030
Fax: (561)575-4118

ANALYTICAL RESULTS

LOG# 1024347
Project ID: KASR

Lab ID: **1024347001** Date Received: 1/7/2010 14:45 Matrix: Aqueous Liquid
Sample ID: **MW-19** Date Collected: 1/6/2010 13:35

Parameters	Results	Units	Report Limit	MDL	DF	Prepared	By	Analyzed	By	Qual	CAS
Analysis Desc: Gross Alpha by EPA 900.0 [REF]			Analytical Method: EPA 900.0								
Gross Alpha	2.9 +/- 0.6	pCi/L	0.50		1			01/14/10	KNL		
Analysis Desc: Alkalinity, EPA 310.2 (W)			Preparation Method: Wet Chem Prep Analytical Method: EPA 310.2								
Alkalinity	87	mg/L	10	5.00	1	01/18/10	BFM	01/18/10	BFM		
Analysis Desc: TDS by 2540C [REF] (W)			Analytical Method: SM 2540C								
Total Dissolved Solids	800	mg/L	40	10.0	1			01/12/10	SO		
Analysis Desc: EPA 200.8 Metals (W)			Preparation Method: EPA 200.2 mod. Analytical Method: EPA 200.8 (Total)								
Beryllium	U	ug/L	2.0	0.066	1	01/07/10	ZS	01/08/10	ZS		7440-41-7
Aluminum	U	ug/L	3.0	0.13	1	01/07/10	ZS	01/08/10	ZS		7429-90-5
Vanadium	0.29i	ug/L	2.0	0.046	1	01/07/10	ZS	01/08/10	ZS		7440-62-2
Chromium	1.2i	ug/L	2.0	0.067	1	01/07/10	ZS	01/08/10	ZS		7440-47-3
Manganese	0.057i	ug/L	2.0	0.028	1	01/07/10	ZS	01/08/10	ZS		7439-96-5
Cobalt	U	ug/L	2.0	0.038	1	01/07/10	ZS	01/08/10	ZS		7440-48-4
Nickel	0.11i	ug/L	2.0	0.059	1	01/07/10	ZS	01/08/10	ZS		7440-02-0
Copper	0.45i	ug/L	2.0	0.034	1	01/07/10	ZS	01/08/10	ZS		7440-50-8
Zinc	1.2i	ug/L	2.0	0.069	1	01/07/10	ZS	01/08/10	ZS		7440-66-6
Arsenic	1.2i	ug/L	2.0	0.16	1	01/07/10	ZS	01/08/10	ZS		7440-38-2
Selenium	U	ug/L	2.0	0.52	1	01/07/10	ZS	01/08/10	ZS		7782-49-2
Silver	U	ug/L	2.0	0.10	1	01/07/10	ZS	01/08/10	ZS		7440-22-4
Cadmium	U	ug/L	2.0	0.071	1	01/07/10	ZS	01/08/10	ZS		7440-43-9
Antimony	U	ug/L	2.0	0.24	1	01/07/10	ZS	01/08/10	ZS		7440-36-0
Barium	25	ug/L	2.0	0.076	1	01/07/10	ZS	01/08/10	ZS		7440-39-3
Thallium	U	ug/L	2.0	0.053	1	01/07/10	ZS	01/08/10	ZS		7440-28-0
Lead	U	ug/L	2.0	0.029	1	01/07/10	ZS	01/08/10	ZS		7439-92-1
Sodium	110000	ug/L	10	0.62	1	01/07/10	ZS	01/08/10	ZS		7440-23-5
Magnesium	33000	ug/L	2.0	0.14	1	01/07/10	ZS	01/08/10	ZS		7439-95-4
Potassium	8300	ug/L	10	5.4	1	01/07/10	ZS	01/08/10	ZS		7440-09-7
Calcium	27000	ug/L	10	1.1	1	01/07/10	ZS	01/08/10	ZS		7440-70-2
Iron	U	ug/L	10	2.4	1	01/07/10	ZS	01/08/10	ZS		7439-89-6

FDOH# E86546

CERTIFICATE OF ANALYSIS

nelac

Jupiter
Environmental Laboratories, Inc.

Jupiter Environmental Laboratories, Inc.
150 S. Old Dixie Highway
Jupiter, FL 33458
Phone: (561)575-0030
Fax: (561)575-4118

ANALYTICAL RESULTS QUALIFIERS

LOG# 1024347
Project ID: KASR

PARAMETER QUALIFIERS

PROJECT COMMENTS

1024347	A reported value of U indicates that the compound was analyzed for but not detected above the MDL. A value flagged with an "i" flag indicates that the reported value is between the laboratory method detection limit and the practical quantitation limit. Report Limit = PQL

SUBCONTRACTOR NELAC CERTIFICATION

1024347	KNL = E84025

FDOH# E86546

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QUALITY CONTROL DATA

LOG# 1024347
Project ID: KASR

QC Batch: MXX/3454 Analysis Method: EPA 200.8 (Total)
QC Batch Method: EPA 200.2 mod.
Associated Lab Samples: 1024346001 1024346002 1024346003 1024346004 1024347001 1024347002 1024348001 1024350002 1024350004 1024350006 1024351001 1024351002 1024352001 1024352002

METHOD BLANK: 24796

Parameter	Units	Blank Result	Reporting Limit	Qualifiers
Beryllium	ug/L	U	2.0	
Aluminum	ug/L	U	3.0	
Vanadium	ug/L	U	2.0	
Chromium	ug/L	U	2.0	
Manganese	ug/L	U	2.0	
Cobalt	ug/L	U	2.0	
Nickel	ug/L	U	2.0	
Copper	ug/L	U	2.0	
Zinc	ug/L	U	2.0	
Arsenic	ug/L	U	2.0	
Selenium	ug/L	U	2.0	
Silver	ug/L	U	2.0	
Cadmium	ug/L	U	2.0	
Antimony	ug/L	U	2.0	
Barium	ug/L	U	2.0	
Thallium	ug/L	U	2.0	
Lead	ug/L	U	2.0	
Sodium	ug/L	U	10	
Magnesium	ug/L	U	2.0	
Potassium	ug/L	U	10	
Calcium	ug/L	U	10	
Iron	ug/L	U	10	

LABORATORY CONTROL SAMPLE & LCSD: 24797 24798

Parameter	Units	Spike Conc.	LCS Result	LCSD Result	LCS % Rec	LCSD % Rec	% Rec Limit	RPD	Max RPD	Qualifiers
Beryllium	ug/L	50	48	47	95.5	94.5	85-115	2.11	20	
Aluminum	ug/L	50	43	43	85	85.9	85-115	0	20	
Vanadium	ug/L	50	50	50	99.3	100	85-115	0	20	
Chromium	ug/L	50	49	49	97.9	98.4	85-115	0	20	
Manganese	ug/L	50	49	48	97.8	96.8	85-115	2.06	20	
Cobalt	ug/L	50	49	49	98.8	98	85-115	0	20	
Nickel	ug/L	50	49	49	97.6	97.2	85-115	0	20	

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QUALITY CONTROL DATA

LOG# 1024347
Project ID: KASR

LABORATORY CONTROL SAMPLE & LCSD: 24797 24798

Parameter	Units	Spike Conc.	LCS Result	LCSD Result	LCS % Rec	LCSD % Rec	% Rec Limit	RPD	Max RPD	Qualifiers
Copper	ug/L	50	49	49	97.9	98.6	85-115	0	20	
Zinc	ug/L	50	48	49	95.5	97.1	85-115	2.06	20	
Arsenic	ug/L	50	46	46	91.3	92.6	85-115	0	20	
Selenium	ug/L	50	48	49	95.1	98.9	85-115	2.06	20	
Silver	ug/L	50	48	49	96	97.2	85-115	2.06	20	
Cadmium	ug/L	50	49	49	97.7	98.1	85-115	0	20	
Antimony	ug/L	50	46	48	91.9	95.2	85-115	4.26	20	
Barium	ug/L	50	51	51	101	102	85-115	0	20	
Thallium	ug/L	50	50	50	101	99.7	85-115	0	20	
Lead	ug/L	50	50	50	101	99.4	85-115	0	20	
Sodium	ug/L	50	51	51	101	102	85-115	0	20	
Magnesium	ug/L	50	48	49	96.9	98.6	85-115	2.06	20	
Potassium	ug/L	50	52	56	105	112	85-115	7.41	20	
Calcium	ug/L	50	48	47	97	94.7	85-115	2.11	20	
Iron	ug/L	50	56	53	112	106	85-115	5.5	20	

MATRIX SPIKE SAMPLE: 24802 Original: 1024346004

Parameter	Units	Original Result	Spike Conc.	MS Result	MS % Rec	% Rec Limits	Qualifiers
Beryllium	ug/L			U			
Aluminum	ug/L			U			
Vanadium	ug/L			U			
Chromium	ug/L			U			
Manganese	ug/L			U			
Cobalt	ug/L			U			
Nickel	ug/L			U			
Copper	ug/L			U			
Zinc	ug/L			U			
Arsenic	ug/L	2.7	50	70	134	70-130	
Selenium	ug/L			U			
Silver	ug/L			U			
Cadmium	ug/L			U			
Antimony	ug/L			U			
Barium	ug/L			U			
Thallium	ug/L			U			
Lead	ug/L			U			
Sodium	ug/L			U			
Magnesium	ug/L			U			
Potassium	ug/L			U			

FDOH# E86546

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Fax: (561)575-4118

QUALITY CONTROL DATA

LOG# 1024347
Project ID: KASR

MATRIX SPIKE SAMPLE: 24802 Original: 1024346004

Parameter	Units	Original Result	Spike Conc.	MS Result	MS % Rec	% Rec Limits	Qualifiers
Calcium	ug/L			U			
Iron	ug/L			U			

SAMPLE DUPLICATE: 24801 Original: 1024346004

Parameter	Units	Original Result	DUP Result	RPD	Max RPD	Qualifiers
Beryllium	ug/L		U			
Aluminum	ug/L		U			
Vanadium	ug/L		U			
Chromium	ug/L		U			
Manganese	ug/L		U			
Cobalt	ug/L		U			
Nickel	ug/L		U			
Copper	ug/L		U			
Zinc	ug/L		U			
Arsenic	ug/L	2.7	2.5	7.69	20	
Selenium	ug/L		U			
Silver	ug/L		U			
Cadmium	ug/L		U			
Antimony	ug/L		U			
Barium	ug/L		U			
Thallium	ug/L		U			
Lead	ug/L		U			
Sodium	ug/L		U			
Magnesium	ug/L		U			
Potassium	ug/L		U			
Calcium	ug/L		U			
Iron	ug/L		U			

FDOH# E86546

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QUALITY CONTROL DATA

LOG# 1024347
Project ID: KASR

QC Batch: WXX/1083 Analysis Method: EPA 310.2
QC Batch Method: Wet Chem Prep
Associated Lab Samples: 1024347001 1024347002

METHOD BLANK: 25062

Parameter	Units	Blank Result	Reporting Limit	Qualifiers
Alkalinity	mg/L	U	10	

LABORATORY CONTROL SAMPLE & LCSD: 25063 25064

Parameter	Units	Spike Conc.	LCS Result	LCSD Result	LCS % Rec	LCSD % Rec	% Rec Limit	RPD	Max RPD	Qualifiers
Alkalinity	mg/L	50	47	49	93.8	98	85-115	4.2	20	

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 25065 25066 Original: 1024347002

Parameter	Units	Original Result	Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limit	RPD	Max RPD	Qualifiers
Alkalinity	mg/L	80	500	570	580	97.8	99.7	85-115	1.7	20	

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QUALITY CONTROL DATA QUALIFIERS

LOG# 1024347
Project ID: KASR

QUALITY CONTROL PARAMETER QUALIFIERS

J4	MS/MSD recovery exceeded control limits due to matrix interference. LCS/LCSD recovery was within acceptable range.

Jupiter
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Phone. (561)575-0030
Fax: (561)575-4118

QUALITY CONTROL DATA CROSS REFERENCE TABLE

LOG# 1024347
Project ID: KASR

Lab ID	Sample ID	QC Batch Method	QC Batch	Analytical Method	Analytical Batch
1024347001	**MW-19**	EPA 200.2 mod.	MXX/3454	EPA 200.8 (Total)	MMS/3144
1024347002	**MW-18**	EPA 200.2 mod.	MXX/3454	EPA 200.8 (Total)	MMS/3144
1024347001	**MW-19**	SM 2540C	REF/2665		
1024347002	**MW-18**	SM 2540C	REF/2665		
1024347001	**MW-19**	Wet Chem Prep	WXX/1083	EPA 310.2	WET/1087
1024347002	**MW-18**	Wet Chem Prep	WXX/1083	EPA 310.2	WET/1087
1024347001	**MW-19**	EPA 900.0	REF/	EPA 900.0	REF/
1024347002	**MW-18**	EPA 900.0	REF/	EPA 900.0	REF/

FDOH# E86546

CERTIFICATE OF ANALYSIS

nelac

HBEL, Inc.

2340 SW Poma Drive, Palm City, FL 34990
Phone: (772) 320-0091 Fax: (772) 320-0145

CERTIFICATE OF ANALYSIS

[2036790]

Client: Jupiter Environmental Laboratories *Workorder ID:* 1024347 GW

Parameter	Qualifier	Result[1]	Units	Reporting Limit	Method	Laboratory Batch	Prep Date/Time	Analyzed Date/Time	Analyst	Lab ID
Laboratory ID: **2036790001** MW-19					*Sampled:* 01/06/10 13:35		*Received:* 01/07/10 17:12			
Sample ID: **1024347 001**					*Matrix:* Water	Results reported on Wet Weight Basis				
Bromide		**0.93**	mg/L	0.014	EPA 300.0	IC8249		01/8/10 15:24	JL	E96080
Chloride		**260**	mg/L	5.0	EPA 300.0	IC8250		01/11/10 10:07	SP	E96080
Fluoride		**0.60**	mg/L	0.011	EPA 300.0	IC8248		01/8/10 9:14	JL	E96080
Nitrate as N		**0.0030U**	mg/L	0.0030	EPA 300.0	IC8248		01/8/10 9:14	JL	E96080
Nitrite as N		**0.0022U**	mg/L	0.0022	EPA 300.0	IC8248		01/8/10 9:14	JL	E96080
Sulfate		**200**	mg/L	1.4	EPA 300.0	IC8250		01/11/10 10:07	SP	E96080
Orthophosphate as P		**0.0085**	mg/L	0.0019	EPA 365.1	AUTO17896		01/8/10 9:10	JL	E96080
Sulfide, as S--		**1.2**	mg/L	0.083	SM20 4500S-F	WCGE32003		01/12/10 7:00	GG	E96080
Laboratory ID: **2036790002** MW-18					*Sampled:* 01/06/10 18:35		*Received:* 01/07/10 17:12			
Sample ID: **1024347 002**					*Matrix:* Water	Results reported on Wet Weight Basis				
Bromide		**0.51**	mg/L	0.014	EPA 300.0	IC8249		01/8/10 16:20	JL	E96080
Chloride		**140**	mg/L	5.0	EPA 300.0	IC8250		01/11/10 13:59	SP	E96080
Fluoride		**0.55**	mg/L	0.011	EPA 300.0	IC8248		01/8/10 10:10	JL	E96080
Nitrate as N		**0.0030U**	mg/L	0.0030	EPA 300.0	IC8248		01/8/10 10:10	JL	E96080
Nitrite as N		**0.0022U**	mg/L	0.0022	EPA 300.0	IC8248		01/8/10 10:10	JL	E96080
Sulfate		**170**	mg/L	1.4	EPA 300.0	IC8250		01/11/10 13:59	SP	E96080
Orthophosphate as P		**0.0085**	mg/L	0.0019	EPA 365.1	AUTO17896		01/8/10 9:10	JL	E96080
Sulfide, as S--		**1.1**	mg/L	0.084	SM20 4500S-F	WCGE32003		01/12/10 7:00	GG	E96080

[1]Result Qualifiers: U = Not Detected I = Analyte detected between the Laboratory Method Detection Limit and Laboratory Reporting Limit
Applicable Florida Department of Environmental Protection Qualifiers defined below. Statement of Estimated Uncertainty available upon request.

APPENDIX 3.4.1

Geophysical Logs of MW-19

AQUIFER DATA SYSTEMS

FT. MYERS, FL. 239-872-5617

CALIPER

CO
WELL
FLD
CTY
STE
FILING No

COMPANY **DIVERSIFIED DRILLING**
WELL ID KISSIMMEE RIVER ASR MW-19
FIELD
COUNTY OKEECHOBEE STATE FL

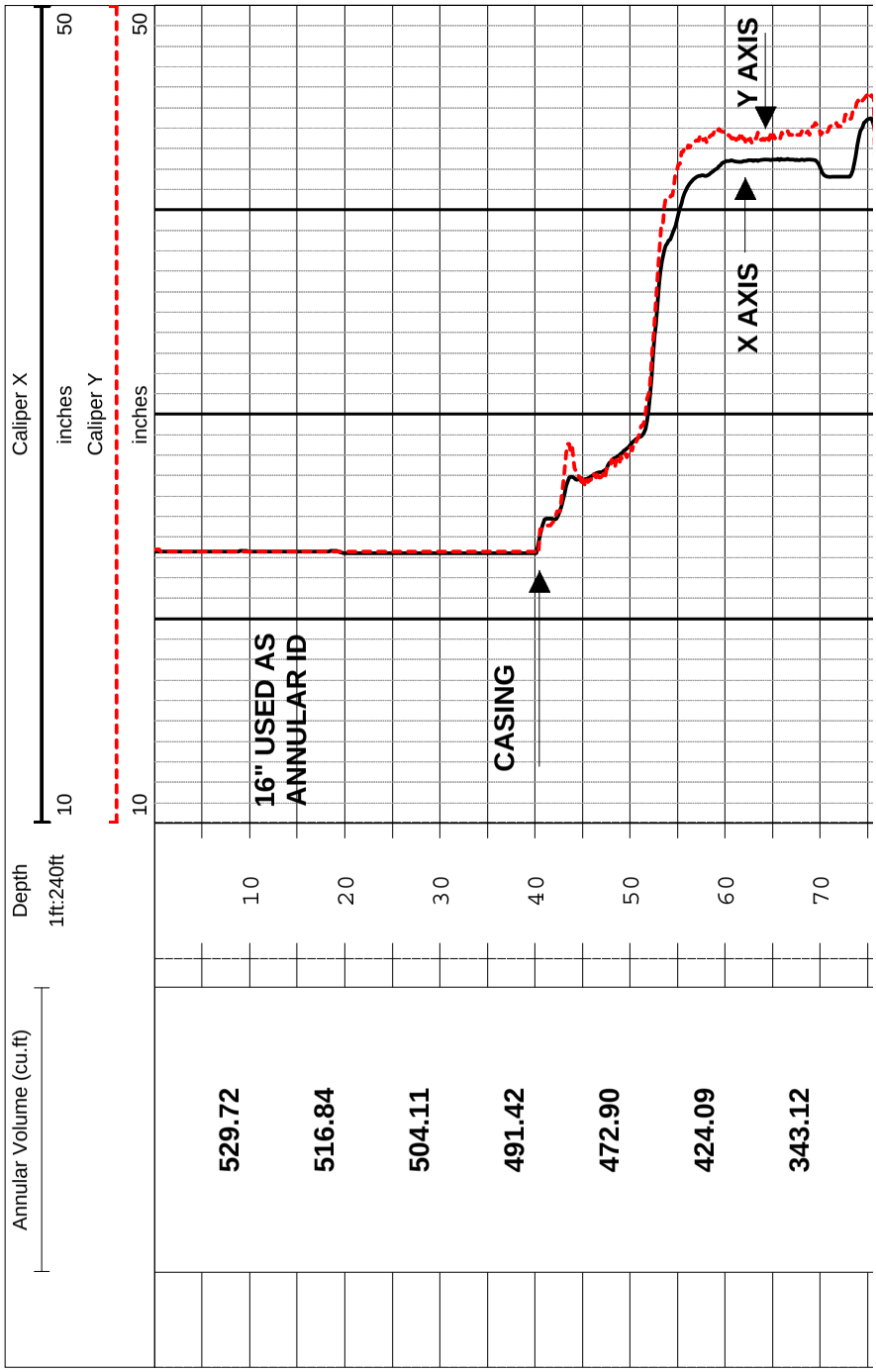
LOCATION
SEC TWP RGE

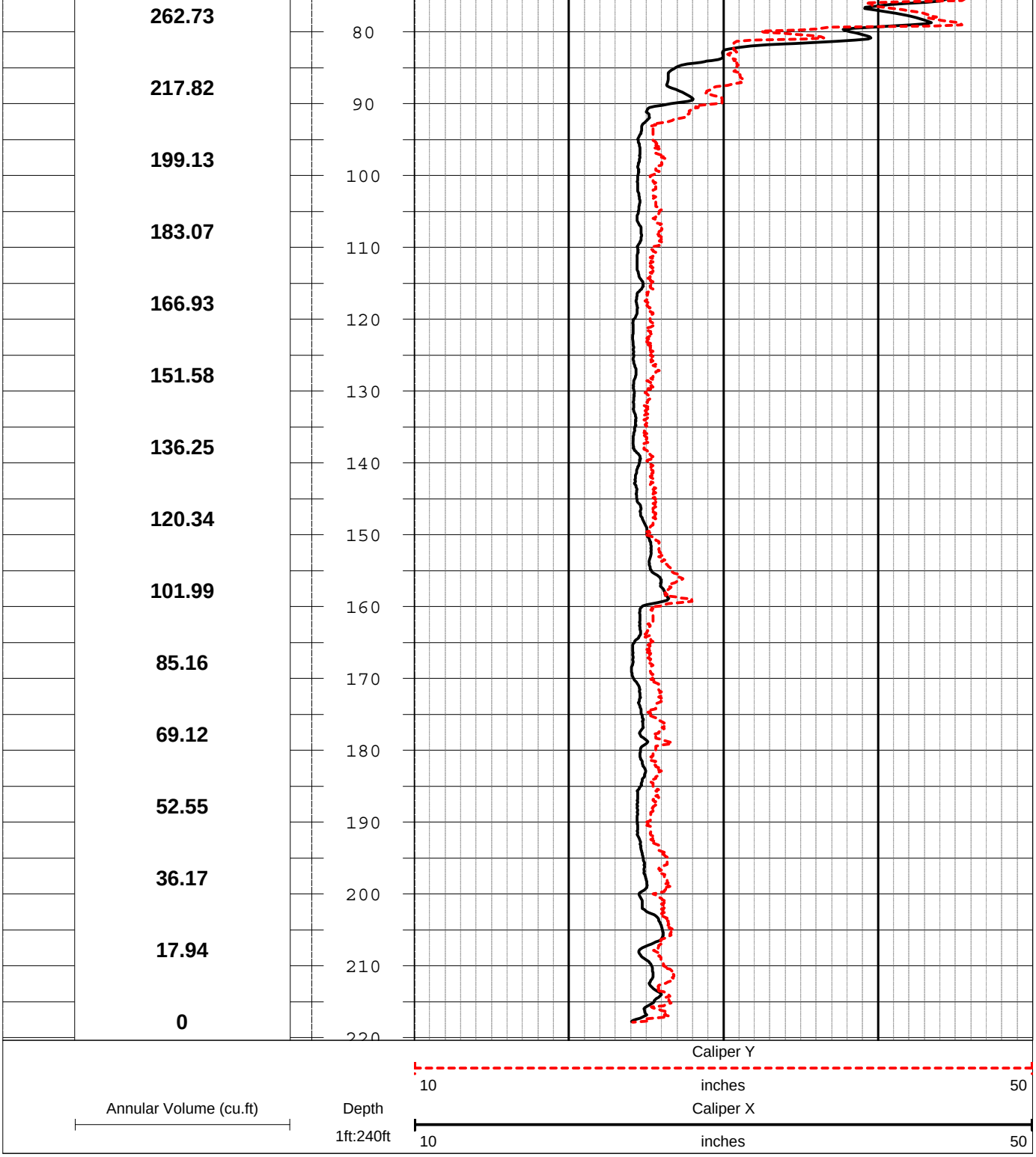
OTHER SERVICES

PERMANENT DATUM		ELEVATION	K.B.
LOG MEAS. FROM	GL	ABOVE PERM. DATUM	D.F.
DRILLING MEAS. FROM	GL		G.L.

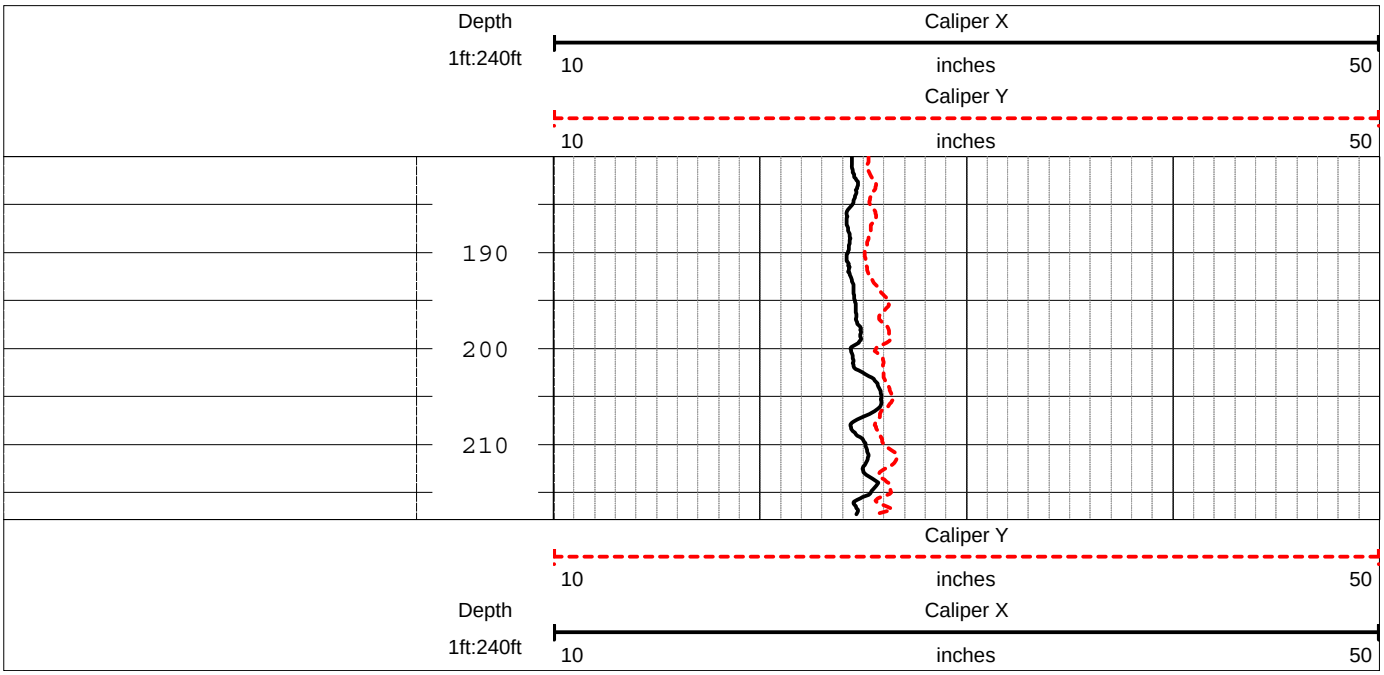
DATE	12-07-09	TYPE FLUID IN HOLE	MUD
RUN No	ONE	SALINITY	
TYPE LOG	XY CALIPER	DENSITY	
DEPTH-DRILLER	218'	LEVEL	FULL
DEPTH-LOGGER	218'	MAX. REC. TEMP.	
BTM LOGGED INTERVAL	218'		
TOP LOGGED INTERVAL	GL		
OPERATING RIG TIME	.5 HOURS		
RECORDED BY	NOVAK/ADS		
WITNESSED BY	CHENEY/ENTRIX		

RUN	BOREHOLE RECORD			CASING RECORD			
NO.	BIT	FROM	TO	SIZE	WGT.	FROM	TO
				24"	STL	SURF	40'
	23"	40'	218'				




262.73
217.82
199.13
183.07
166.93
151.58
136.25
120.34
101.99
85.16
69.12
52.55
36.17
17.94
0
80
90
100
110
120
130
140
150
160
170
180
190
200
210
220
Caliper Y
10
inches
50
Annular Volume (cu.ft)
Depth
1ft:240ft
Caliper X
10
inches
50

REPEAT SECTION



Company	Diversified Drilling Corporation
Well	Kissimmee River ASR MW-19
Field	Lake Okeechobee NW
County	Okeechobee
State/Prv	Florida

MV Geophysical

X-Y CALIPER GAMMA RAY LOG

Company: Diversified Drilling Corporation
Well: Kissimmee River ASR MW-19
Field: Lake Okeechobee NW
County: Okeechobee   State/Prv: Florida
Location: Buckshead Ridge, Hwy 78, East Bank of Kissimmee River
Lat.: N27 09' 52.7"   Long.: W 080 52' 54.2"
Other Services: XYGR, BHC/VDL, DLL/SP
Permanent Datum: G.L.   Elevation: na
Log Measured From: G.L.   Drilling Measured From: G.L.
K.B. na   D.F. na   G.L. na

Date: 16-DEC-2009
Run Number: ONE
Depth Driller: 890'
Depth Logger: 891'
Bottom Logged Interval: 891'
Top Log Interval: SURFACE
Open Hole Size: 11.875"
Type Fluid: MUD
Density / Viscosity: na
Max. Recorded Temp.: na
Estimated Cement Top: na
Time Well Ready: 09:30 12/16/09
Time Logger on Bottom: 09:30 12/16/09
Equipment Number: XYCS
Location: FtM
Recorded By: D.Lee (DTRX)
Witnessed By: RossMagna (DDC)

Borehole Record Run Number	Bit	From	To
ONE	22.75"	0'	55'
TWO	17.5"	55'	215'
THREE	11.875"	215'	890'

Casing Record	Size	Wgt/Ft	Top	Bottom
Surface String	24"		SURFACE	40'
Prot. String	16"	.375" WT	SURFACE	215'
Production String				
Liner				

Invoice No. 2009179   P.O.# 11840   JOB #: 70905   • Final, PRINT •

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All interpretations are opinions based on inferences from electrical or other measurements and we cannot and do not guarantee the accuracy or correctness of any interpretation, and we shall not, except in the case of gross or willful negligence on our part, be liable or responsible for any loss, costs, damages, or expenses incurred or sustained by anyone resulting from any interpretation made by any of our officers, agents or employees. These interpretations are also subject to our general terms and conditions set out in our current Price Schedule.

Comments

MAXIMUM Caliper Arm Extension: 33"

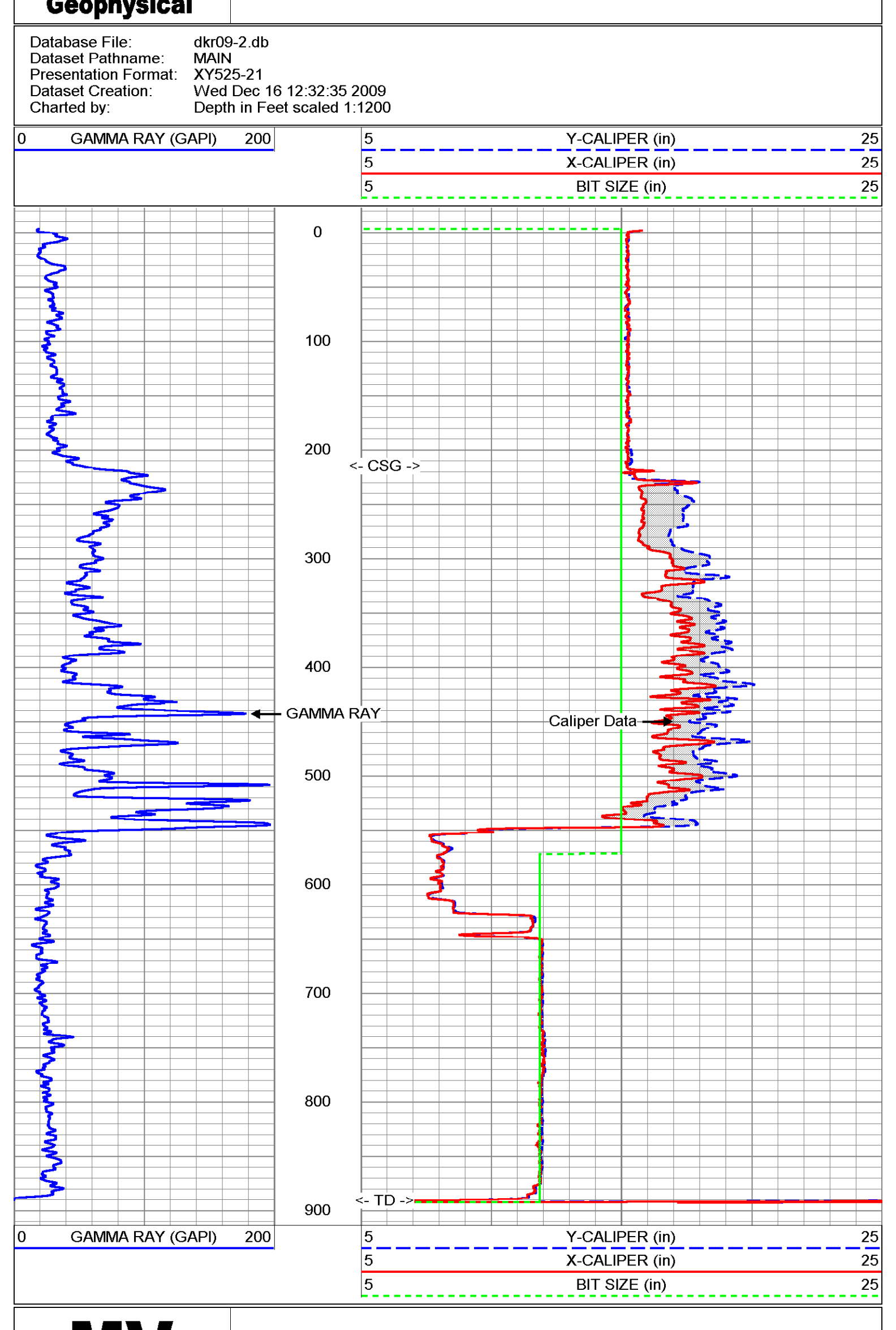
FUTURE CASING SIZE: 6.625" OD

U.S. Army Corp of Engineers

MV Geophysical

MAIN PASS

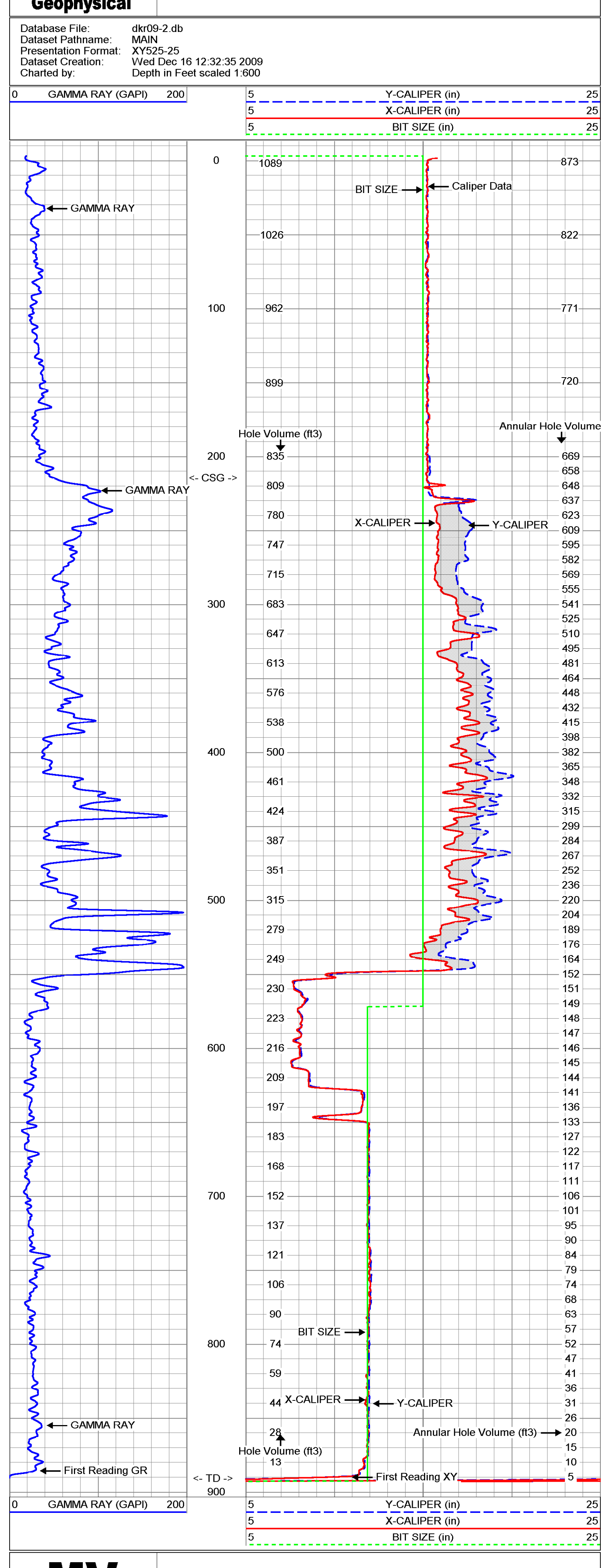
Database File: dkr09-2.db
Dataset Pathname: MAIN
Presentation Format: XY525-21
Dataset Creation: Wed Dec 16 12:32:35 2009
Charted by: Depth in Feet scaled 1:1200



MV Geophysical

MAIN PASS

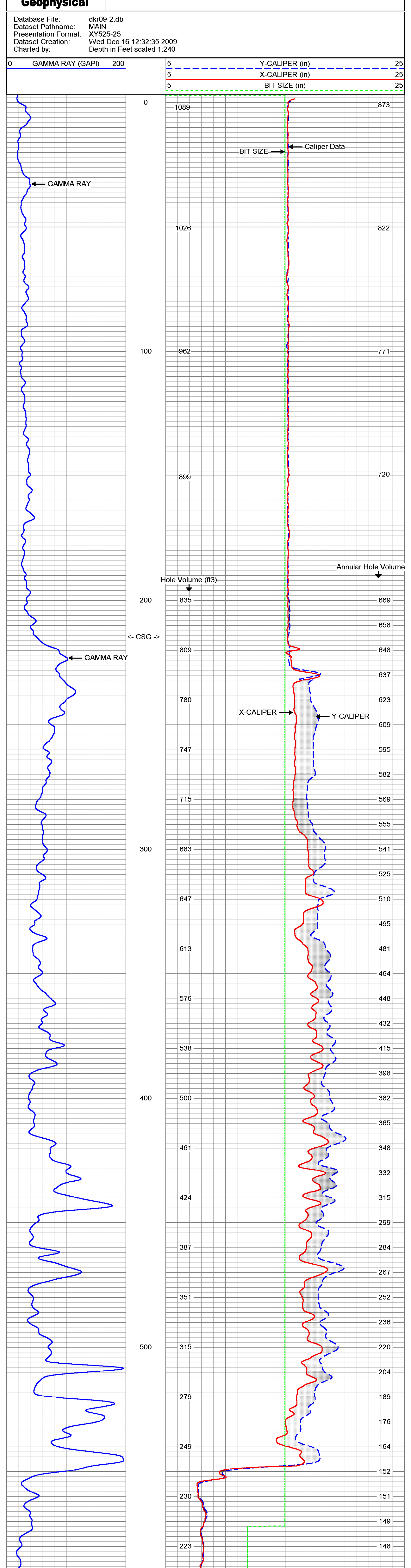
Database File: dkr09-2.db
Dataset Pathname: MAIN
Presentation Format: XY525-25
Dataset Creation: Wed Dec 16 12:32:35 2009
Charted by: Depth in Feet scaled 1:600



MV Geophysical

MAIN PASS

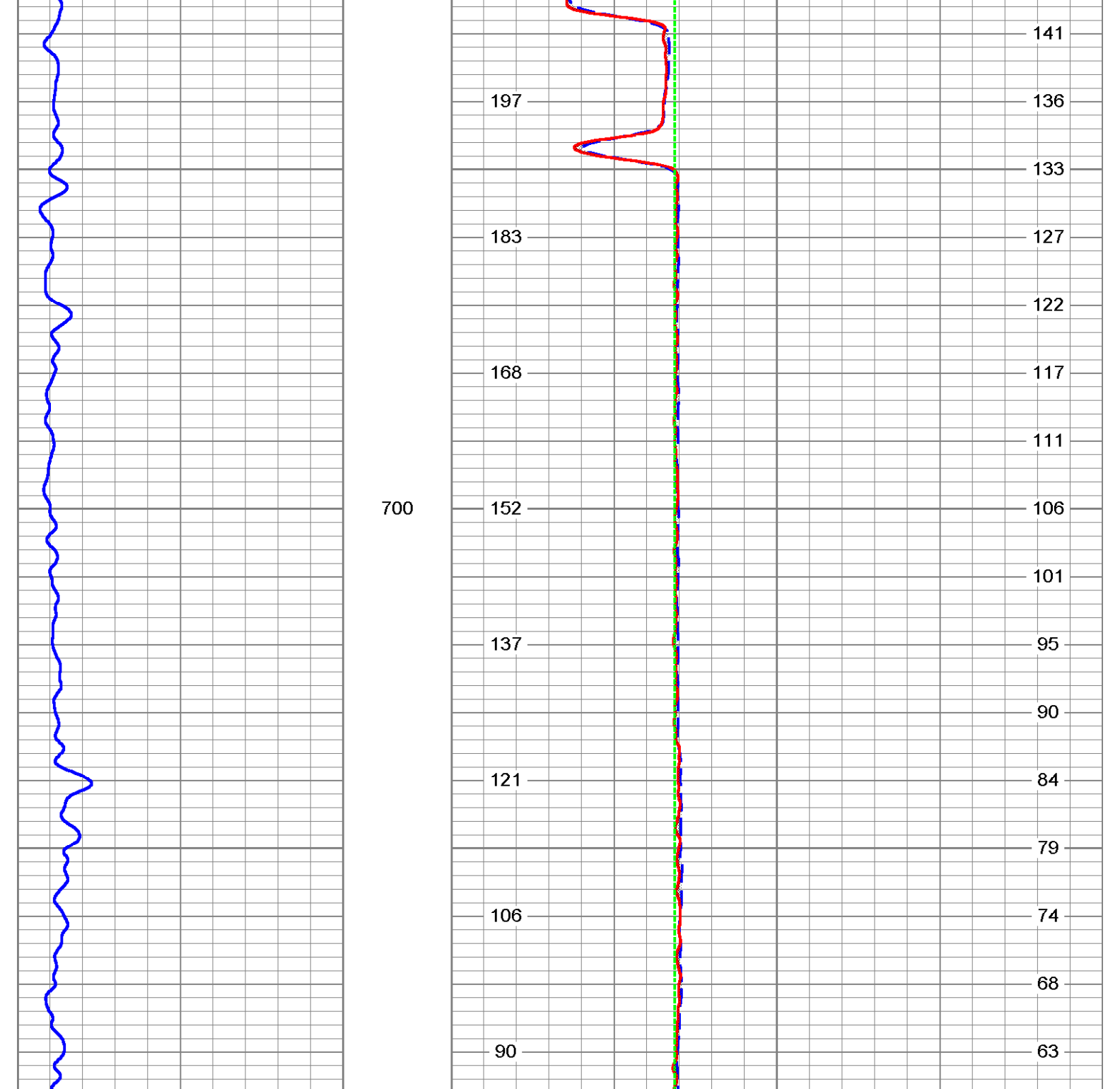
Database File: dkr09-2.db
Dataset Pathname: MAIN
Presentation Format: XY525-25
Dataset Creation: Wed Dec 16 12:32:35 2009
Charted by: Depth in Feet scaled 1:240



MV Geophysical

REPEAT SECTION

Database File: dkr09-2.db
Dataset Pathname: REPEAT
Presentation Format: XY525-25
Dataset Creation: Wed Dec 16 11:50:07 2009
Charted by: Depth in Feet scaled 1:240

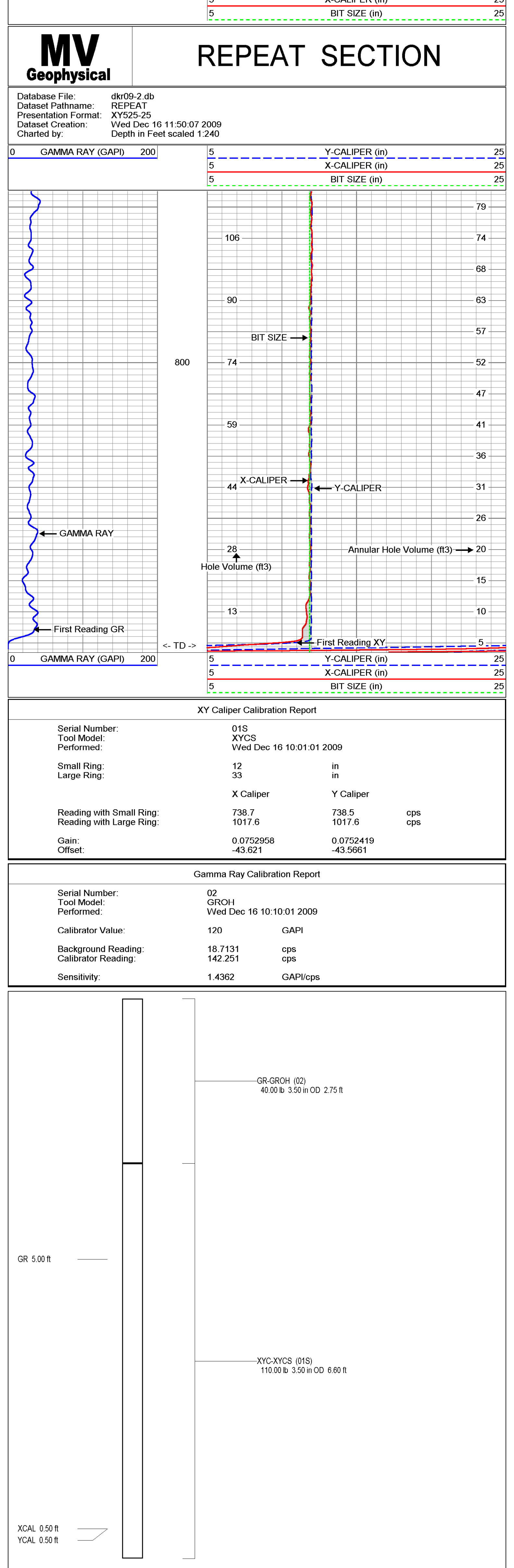


XY Caliper Calibration Report

Serial Number:	01S		
Tool Model:	XYCS		
Performed:	Wed Dec 16 10:01:01 2009		
Small Ring:	12	in	
Large Ring:	33	in	
	X Caliper	Y Caliper	
Reading with Small Ring:	738.7	738.5	cps
Reading with Large Ring:	1017.6	1017.6	cps
Gain:	0.0752958	0.0752419	
Offset:	-43.621	-43.5661	

Gamma Ray Calibration Report

Serial Number:	02	
Tool Model:	GROH	
Performed:	Wed Dec 16 10:10:01 2009	
Calibrator Value:	120	GAPI
Background Reading:	18.7131	cps
Calibrator Reading:	142.251	cps
Sensitivity:	1.4362	GAPI/cps



Dataset: run1/pass4
Total Length: 9.35 ft
Total Weight: 150.00 lb
O.D. 3.50 in

MV Geophysical

DUAL INDUCTION LL3 / SP LOG

Company	Diversified Drilling Corporation
Well	Kissimmee River ASR MW-19
Field	Lake Okeechobee NW
County	Okeechobee
State/Prv	Florida

Location: Buckshead Ridge, Hwy 78, East Bank of Kissimmee River, Lat.: N27 09' 52.7" Long.: W 080 52' 54.2"

Other Services: XY/GR, DIL/SP, BHC/VDL

Permanent Datum	G.L.	Elevation	na
Log Measured From	G.L.	Elevation	K.B. na, D.F. na, G.L. na
Drilling Measured From	G.L.		

Date	16-DEC-2009
Run Number	ONE
Depth Driller	890'
Depth Logger	891'
Bottom Logged Interval	889'
Top Log Interval	215'
Open Hole Size	11.875"
Type Fluid	MUD
Density / Viscosity	NA/NA
Max. Recorded Temp.	na
Estimated Cement Top	na
Time Well Ready	09:30 12/16/09
Time Logger on Bottom	11:15 12/16/09
Equipment Number	MVGS-1
Location	FTM
Recorded By	S.Miller/C.Miller
Witnessed By	D.Lee (ENTRIX), Ross/Magnus (DDC)

Borehole Record / Tubing Record

Run Number	Bit	From	To	Size	Weight	From	To
ONE	22.75"	93'	218'				
TWO	15"	215'	575'				
THREE	11.875"	575'	890'				
			891'Logger				

Casing Record	Size	Wgt/Ft	Top	Bottom
Surface String	24"	.375" WT	SURFACE	40'
Prot. String	16"	.375" WT	SURFACE	215'
Production String				
Liner				

Invoice No.: 2009179 P.O.#: 111840 JOB #: 70905 * FINAL PRINT *

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Comments

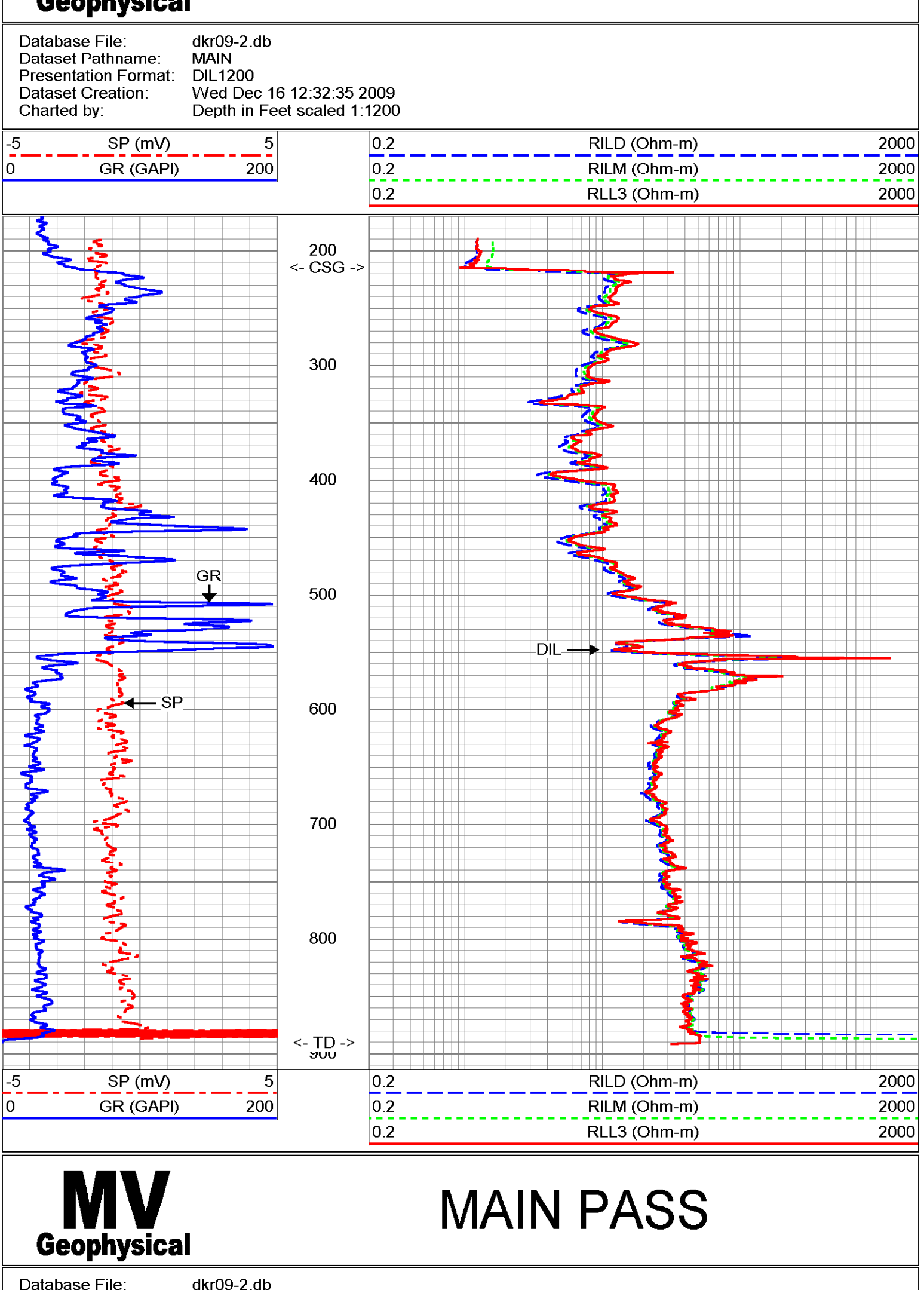
Rm=2.515 ohm-m @ 81.1 degF

U.S. Army Corp of Engineers

MV Geophysical — MAIN PASS

Database File: dkr09-2.db
Dataset Pathname: MAIN
Presentation Format: DIL1200
Dataset Creation: Wed Dec 16 12:32:35 2009
Charted by: Depth in Feet scaled 1:1200

-5 SP (mV) 5		0.2 RILD (Ohm-m) 2000	
0 GR (GAPI) 200		0.2 RILM (Ohm-m) 2000	
		0.2 RLL3 (Ohm-m) 2000	

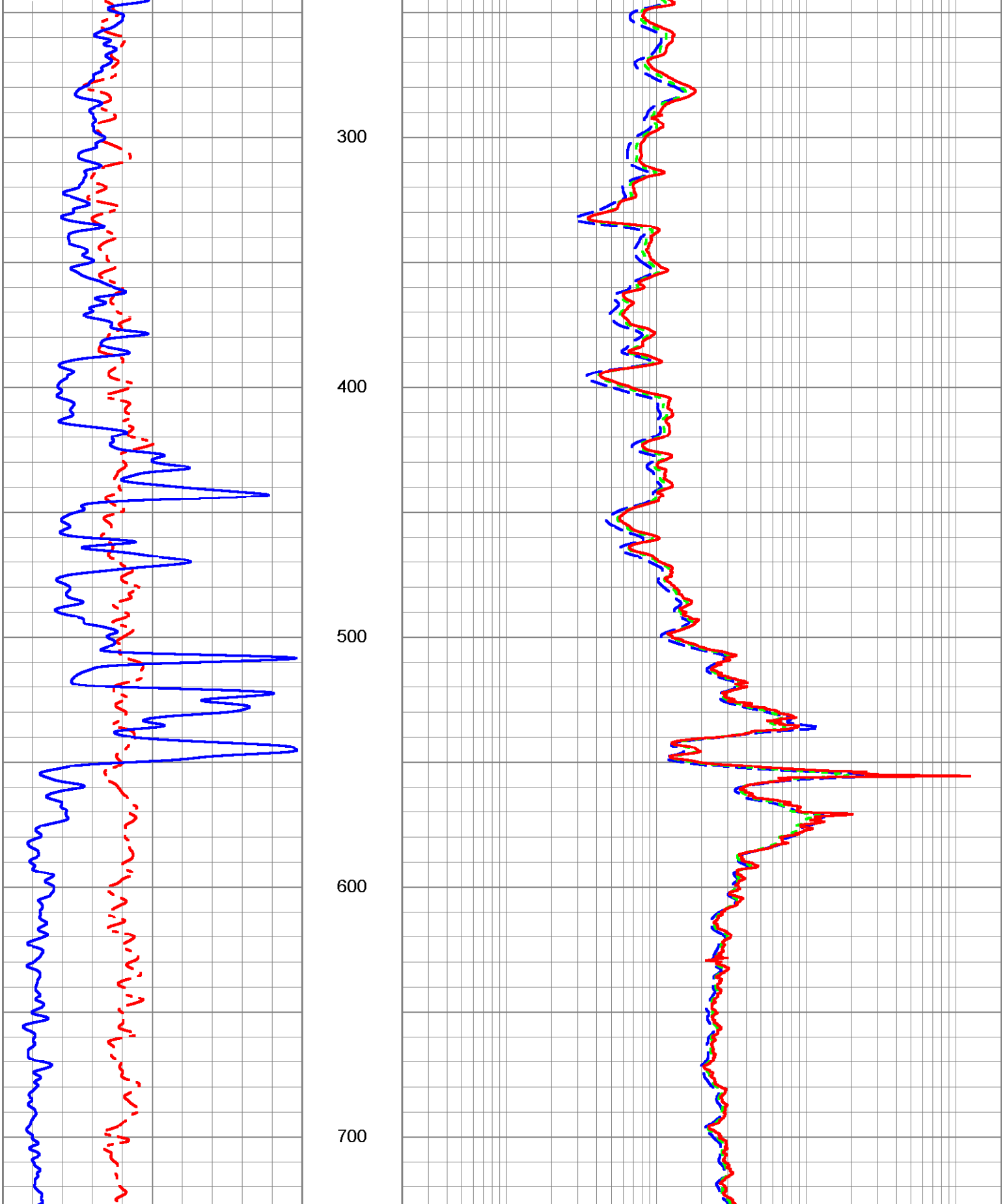


-5 SP (mV) 5		0.2 RILD (Ohm-m) 2000	
0 GR (GAPI) 200		0.2 RILM (Ohm-m) 2000	
		0.2 RLL3 (Ohm-m) 2000	

MV Geophysical — MAIN PASS

Database File: dkr09-2.db
Dataset Pathname: MAIN
Presentation Format: DIL200
Dataset Creation: Wed Dec 16 12:32:35 2009
Charted by: Depth in Feet scaled 1:600

-5 SP (mV) 5		0.2 RILD (Ohm-m) 2000	
0 GR (GAPI) 200		0.2 RILM (Ohm-m) 2000	
		0.2 RLL3 (Ohm-m) 2000	

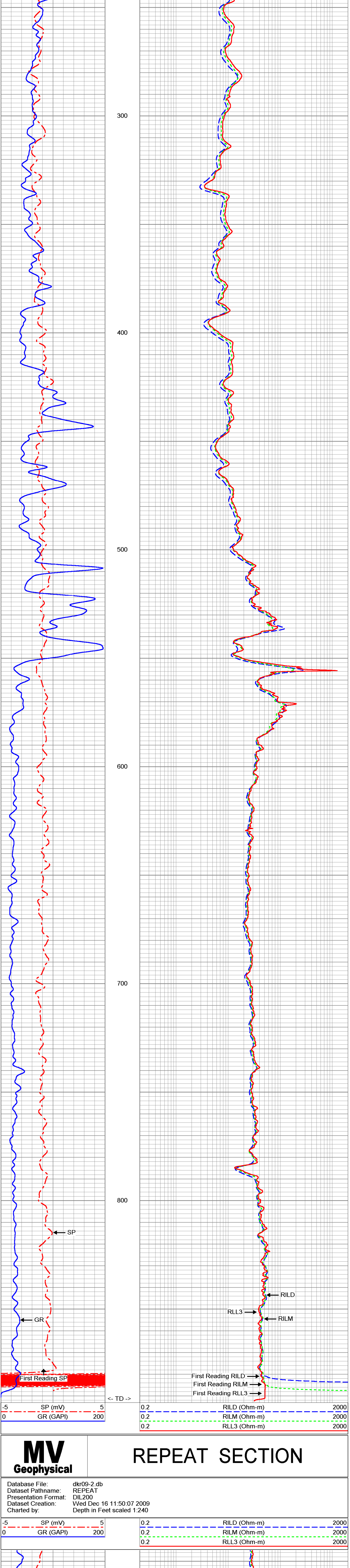


-5 SP (mV) 5		0.2 RILD (Ohm-m) 2000	
0 GR (GAPI) 200		0.2 RILM (Ohm-m) 2000	
		0.2 RLL3 (Ohm-m) 2000	

MV Geophysical — MAIN PASS

Database File: dkr09-2.db
Dataset Pathname: MAIN
Presentation Format: DIL200
Dataset Creation: Wed Dec 16 12:32:35 2009
Charted by: Depth in Feet scaled 1:240

-5 SP (mV) 5		0.2 RILD (Ohm-m) 2000	
0 GR (GAPI) 200		0.2 RILM (Ohm-m) 2000	
		0.2 RLL3 (Ohm-m) 2000	

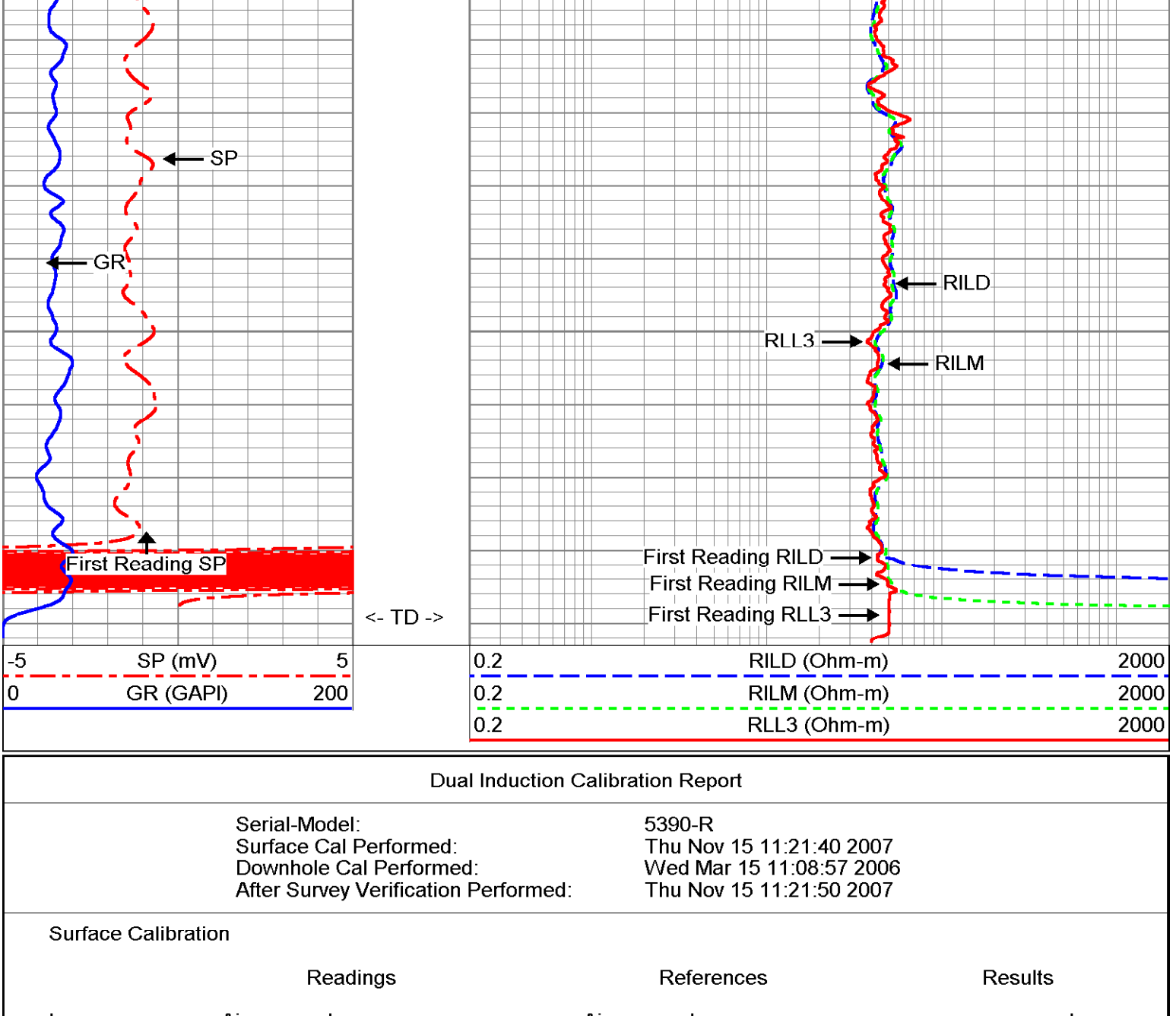


-5 SP (mV) 5		0.2 RILD (Ohm-m) 2000	
0 GR (GAPI) 200		0.2 RILM (Ohm-m) 2000	
		0.2 RLL3 (Ohm-m) 2000	

MV Geophysical — REPEAT SECTION

Database File: dkr09-2.db
Dataset Pathname: REPEAT
Presentation Format: DIL200
Dataset Creation: Wed Dec 16 11:50:07 2009
Charted by: Depth in Feet scaled 1:240

-5 SP (mV) 5		0.2 RILD (Ohm-m) 2000	
0 GR (GAPI) 200		0.2 RILM (Ohm-m) 2000	
		0.2 RLL3 (Ohm-m) 2000	



-5 SP (mV) 5		0.2 RILD (Ohm-m) 2000	
0 GR (GAPI) 200		0.2 RILM (Ohm-m) 2000	
		0.2 RLL3 (Ohm-m) 2000	

Dual Induction Calibration Report

Serial-Model: 5390-R
Surface Cal Performed: Thu Nov 15 11:21:40 2007
Downhole Cal Performed: Wed Mar 15 11:08:57 2006
After Survey Verification Performed: Thu Nov 15 11:21:50 2007

Surface Calibration

Loop:	Readings Air	Readings Loop		References Air	References Loop		Results m	Results b
Deep	0.050	0.646	V	0.000	400.000	mmho-m	671.771	-33.646
Medium	0.001	0.732	V	0.000	464.000	mmho-m	634.710	-0.492

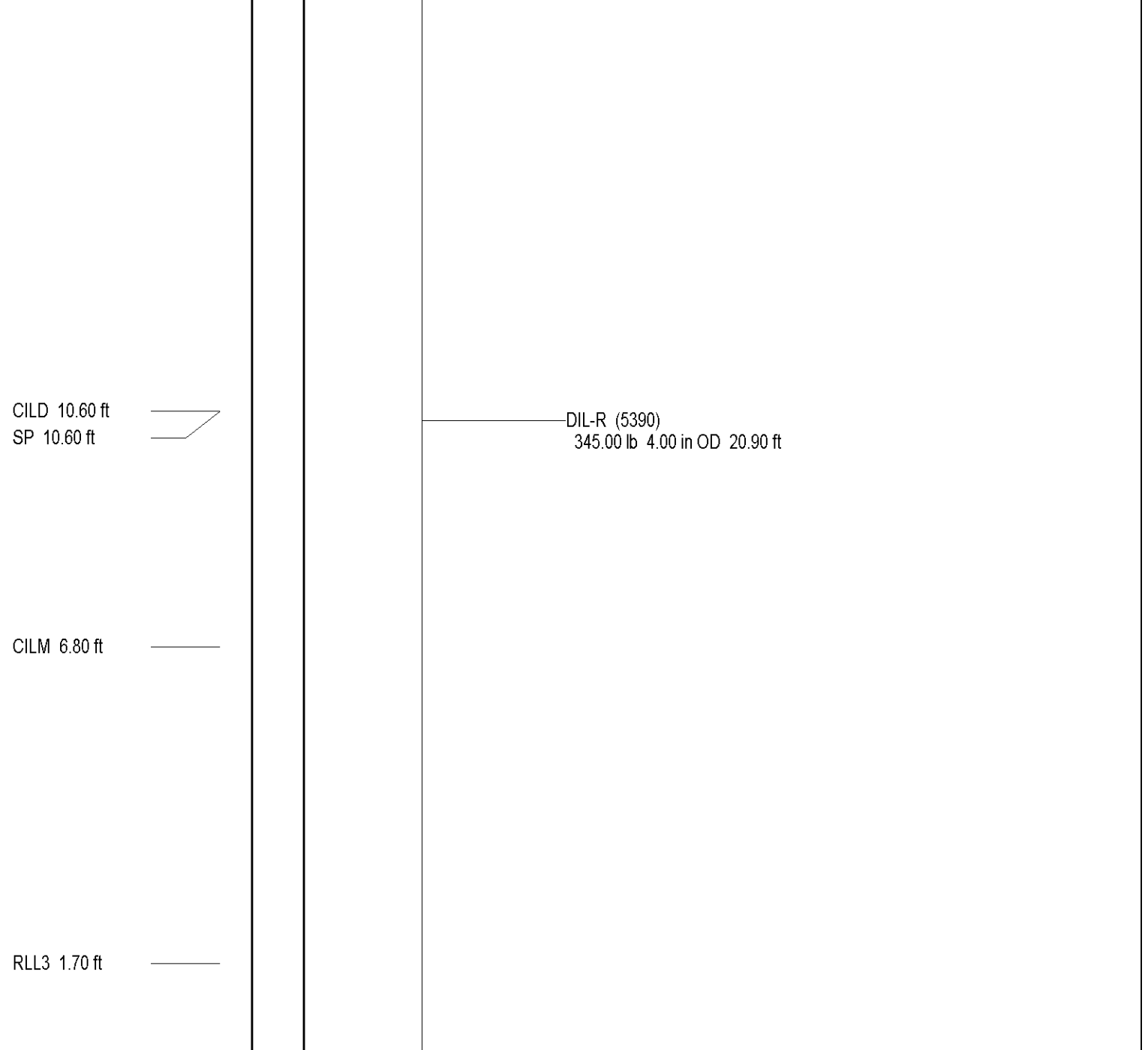
Internal:	Zero	Cal		Zero	Cal		m	b
Deep	0.011	0.641	V	0.000	400.000	mmho-m	634.996	-7.104
Medium	-0.009	0.738	V	0.000	464.000	mmho-m	620.900	5.734

Downhole Calibration

Internal:	Readings Zero	Readings Cal		References Zero	References Cal		Results m	Results b
Deep	-26.499	398.282	mmho-m	-26.130	397.036	mmho-m	0.996	0.268
Medium	-5.803	469.733	mmho-m	-6.353	467.967	mmho-m	0.997	-0.565
Shallow	2.503	0.010	V	494.500	2.000	Ohm-m	197.537	0.041

After Survey Verification

Internal:	Readings Zero	Readings Cal		Targets Zero	Targets Cal		Results m'	Results b'
Deep	-26.151	398.470	mmho-m	-26.499	398.282	mmho-m	0.996	0.268
Medium	-5.737	470.303	mmho-m	-5.803	469.733	mmho-m	0.997	-0.565
Shallow	567.058	128.961	Ohm-m	494.500	2.000	Ohm-m	1.124	-142.975



Dataset: run1/pass10
Total Length: 20.90 ft
Total Weight: 345.00 lb
O.D.: 4.00 in

MV Geophysical

BOREHOLE COMPENSATED SONIC w/ VARIABLE DENSITY LOG

Company	Diversified Drilling Corporation
Well	Kissimmee River ASR MW-19
Field	Lake Okeechobee NW
County	Okeechobee
State/Prv	Florida
Location	Buckshead Ridge, Hwy 78 East Bank of Kissimmee River
	Lat: N27 09' 52.7" Long: W 080 52' 54.2"
Other Services	XYGR DLSP BHC/VDL
Permanent Datum	G.L.
Log Measured From	G.L.
Drilling Measured From	G.L.
Elevation	K.B. na, D.F. na, G.L. na
Date	16-DEC-2009

All interpretations are opinions based on inferences from electrical or other measurements and we cannot and do not guarantee the accuracy or correctness of any interpretation, and we shall not, except in the case of gross or willful negligence on our part, be liable or responsible for any loss, costs, damages, or expenses incurred or sustained by anyone resulting from any interpretation made by any of our officers, agents or employees. These interpretations are also subject to our general terms and conditions set out in our current Price Schedule.

Comments

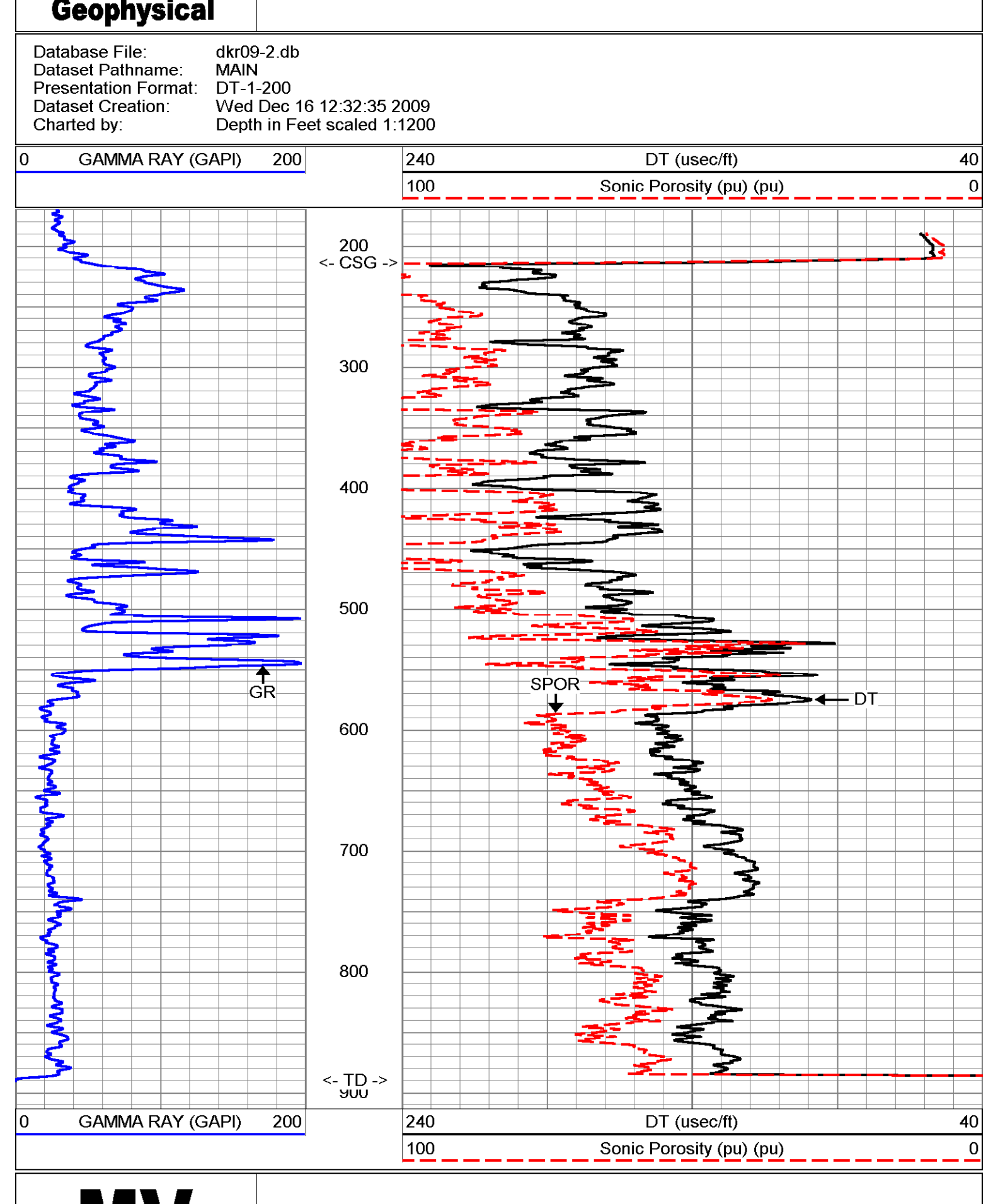
Sonic Porosity was run on a Limestone Matrix (=47.5)

U.S. Army Corp of Engineers

MV Geophysical

MAIN PASS

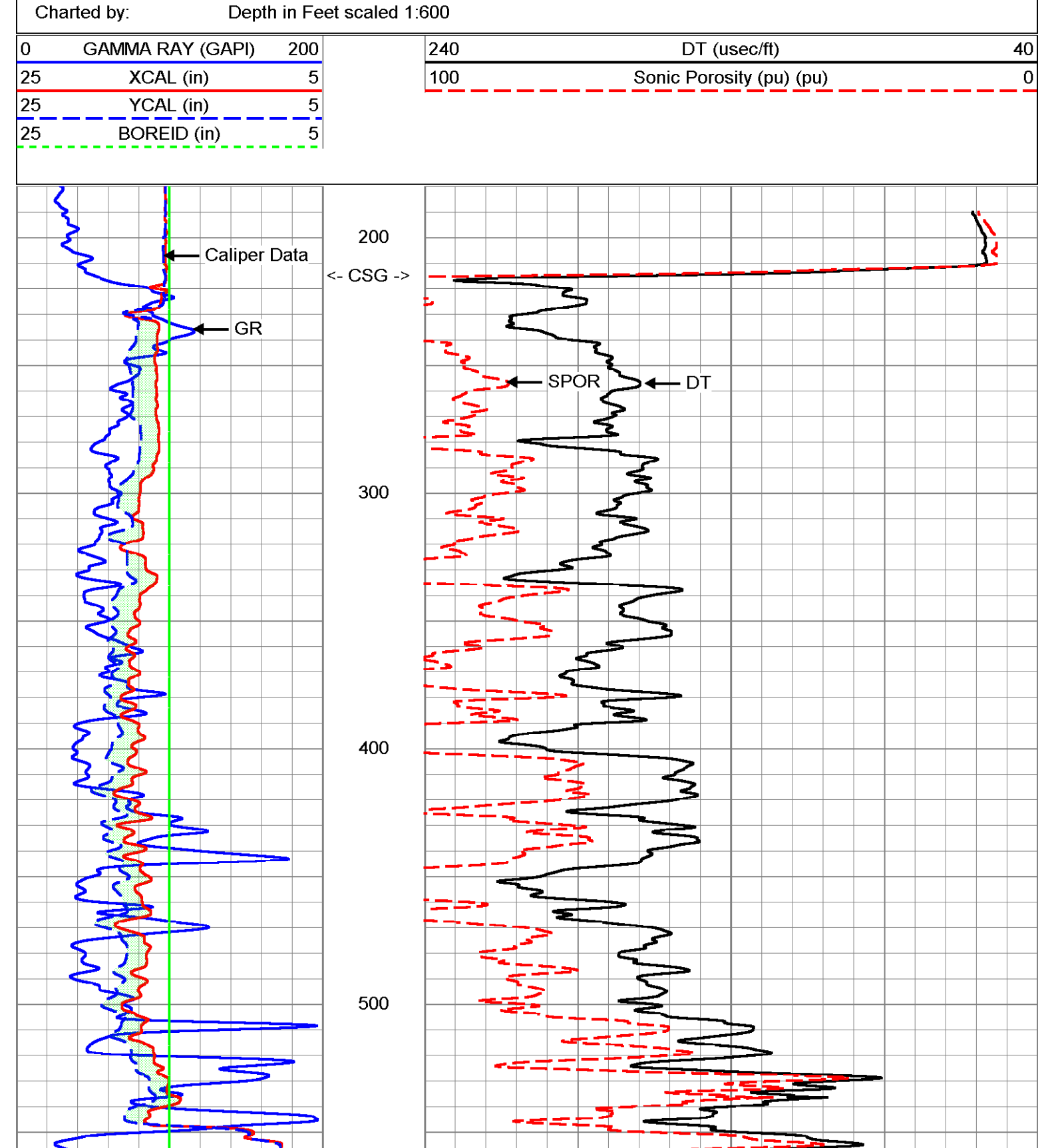
Database File: dkr09-2.db
Dataset Pathname: MAIN
Presentation Format: DT-1-200
Dataset Creation: Wed Dec 16 12:32:35 2009
Charted by: Depth in Feet scaled 1:1200



MV Geophysical

MAIN PASS

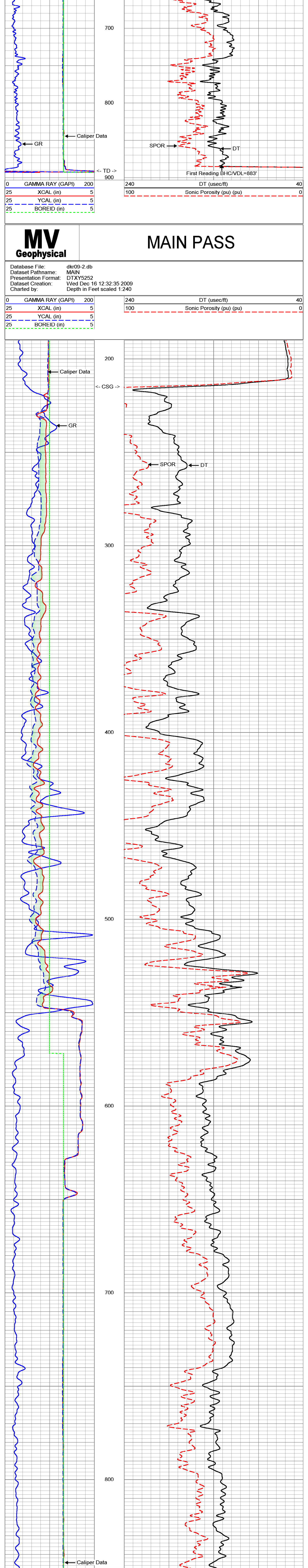
Database File: dkr09-2.db
Dataset Pathname: MAIN
Presentation Format: DTXY5252
Dataset Creation: Wed Dec 16 12:32:35 2009
Charted by: Depth in Feet scaled 1:600



MV Geophysical

MAIN PASS

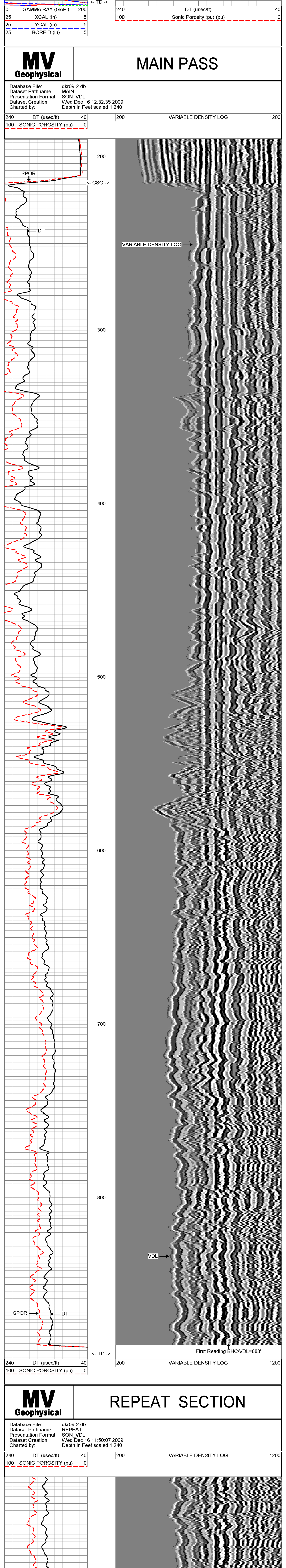
Database File: dkr09-2.db
Dataset Pathname: MAIN
Presentation Format: DTXY5252
Dataset Creation: Wed Dec 16 12:32:35 2009
Charted by: Depth in Feet scaled 1:240



MV Geophysical

MAIN PASS

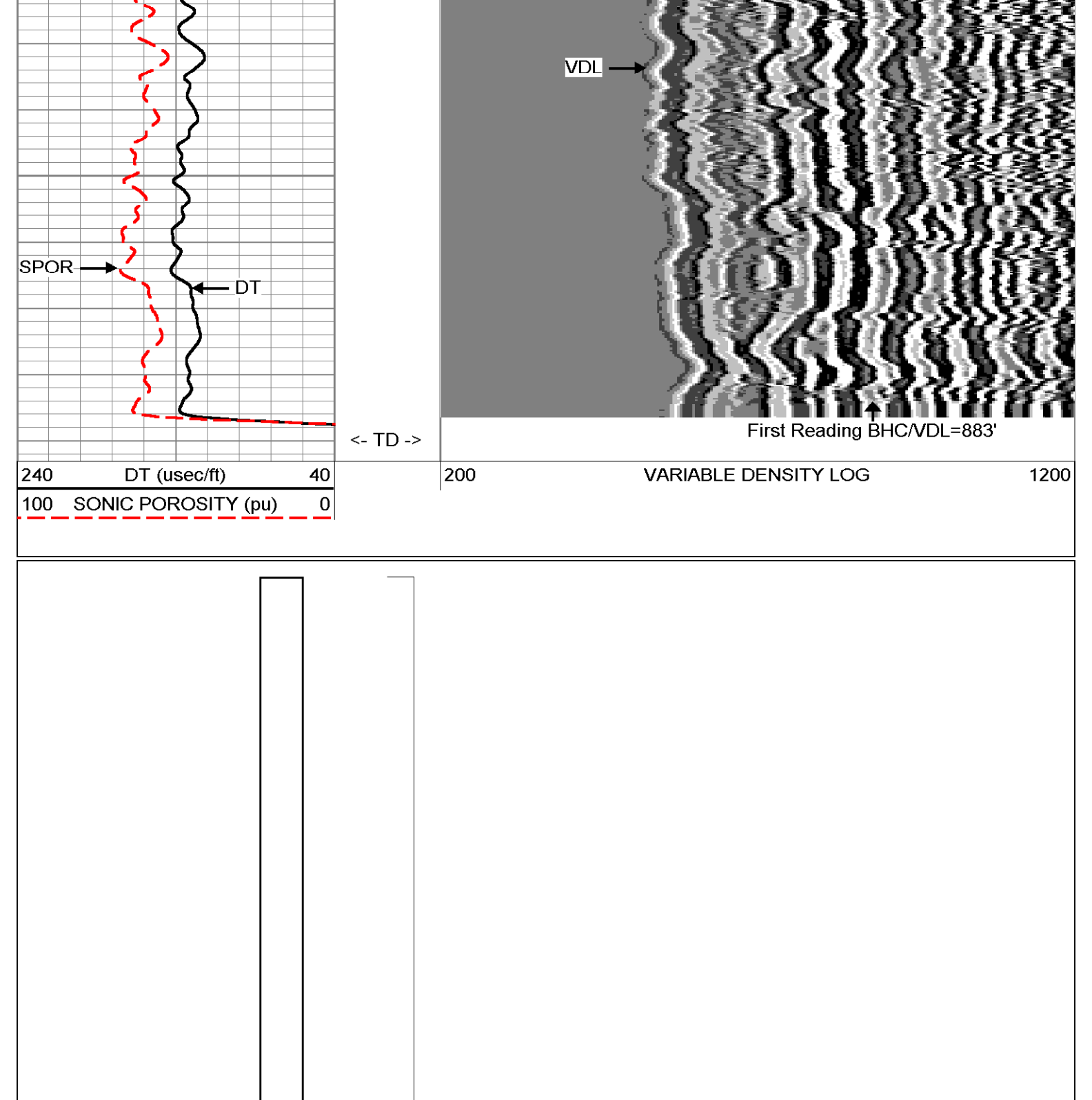
Database File: dkr09-2.db
Dataset Pathname: MAIN
Presentation Format: SON_VDL
Dataset Creation: Wed Dec 16 12:32:35 2009
Charted by: Depth in Feet scaled 1:240

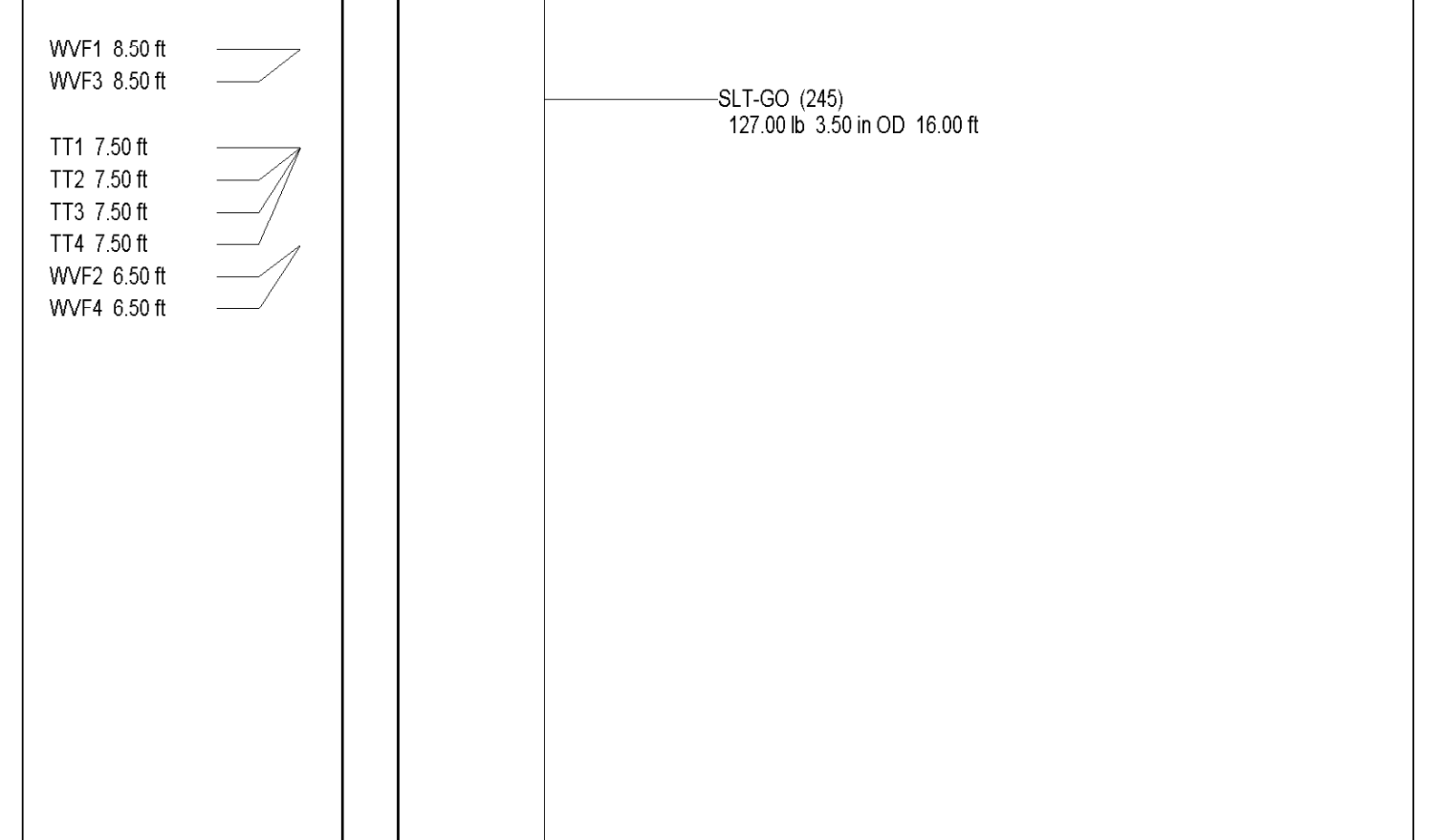


MV Geophysical

REPEAT SECTION

Database File: dkr09-2.db
Dataset Pathname: REPEAT
Presentation Format: SON_VDL
Dataset Creation: Wed Dec 16 11:50:07 2009
Charted by: Depth in Feet scaled 1:240





Dataset: run1/pass13
Total Length: 16.00 ft
Total Weight: 127.00 lb
O.D.: 3.50 in

APPENDIX 3.4.2

Video Log of MW-19

ENTRIX

Down to Earth. Down to Business.™

Date: 1/7/2010

Project Name: ASR Floridan Aquifer Monitor Well Construction

Project No.: 00061013.00

Witnessed By: Donald J. Lee, P.G. (DJL), Karen L. Cheney, P.G.

Transcribed by: Curtis R. Klug

Well: MW-19

Video Log

Start Log Time: 11:14

End Log Time: 12:52

Elapsed Time	Description of Activities
00:00	Begin video log, descent, downhole view in 6-inch Certa-Lok™ casing, water very clear.
01:25	Bottom uppermost casing joint #1 (20'); considerable shallow scoring in casing.
02:39	Bottom casing joint #2 (40'); considerable shallow scoring in casing.
03:38	Bottom casing joint #3 (60'); considerable shallow scoring in casing, may be some deep.
04:36	Bottom casing joint #4 (80'); considerable shallow scoring in casing.
05:35	Bottom casing joint #5 (100'); considerable shallow scoring in casing.
06:33	Bottom casing joint #6 (120'); considerable shallow scoring in casing.
07:32	Bottom casing joint #7 (140'); considerable shallow scoring in casing.
08:30	Bottom casing joint #8 (160'); moderate shallow scoring in casing.
09:28	Bottom casing joint #9 (180'); moderate shallow scoring in casing.
10:27	Bottom casing joint #10 (199'); moderate shallow scoring in casing, video dark.
11:26	Bottom casing joint #11 (219'); moderate shallow scoring in casing.
12:24	Bottom casing joint #12 (240'); moderate shallow scoring in casing.
13:23	Bottom casing joint #13 (260'); moderate shallow scoring in casing.
14:21	Bottom casing joint #14 (280') ; moderate shallow scoring in casing.
15:20	Bottom casing joint #15 (300') ; moderate shallow scoring in casing.
16:18	Bottom casing joint #16 (320') ; moderate shallow scoring in casing.
17:50	Bottom casing joint #17 (340') ; moderate shallow scoring in casing.
18:08	Bottom casing joint #18 (360') ; moderate shallow scoring in casing.
19:01	Bottom casing joint #19 (380') ; moderate shallow scoring in casing.
19:54	Bottom casing joint #20 (400') ; moderate shallow scoring in casing.
20:47	Bottom casing joint #21 (420') ; moderate shallow scoring in casing.
21:42	Bottom casing joint #22 (440') ; moderate shallow scoring in casing.
22:36	Bottom casing joint #23 (460') ; moderate shallow scoring in casing.
23:31	Bottom casing joint #24 (480') ; moderate shallow scoring in casing.
24:25	Bottom casing joint #25 (500') ; moderate shallow scoring in casing.
25:20	Bottom casing joint #26 (520') ; moderate shallow scoring in casing.
26:14	Bottom casing joint #27 (540') ; moderate shallow scoring in casing.
27:09	Bottom casing joint #28 (560') ; moderate shallow scoring in casing.
27:50	Bottom lowermost casing joint #29 (571') ; moderate shallow scoring in casing.

ENTRIX
Down to Earth. Down to Business.™

Date: 1/7/2010
Project Name: ASR Floridan Aquifer Monitor Well Construction
Project No.: 00061013.00
Witnessed By: Donald J. Lee, P.G. (DJL); Karen L. Cheney, P.G.
Transcribed by: Curtis R. Klug
Well: MW-19

Video Log

Start Log Time: 11:14
End Log Time: 12:52

Elapsed Time	Description of Activities
28:23	Switch to sidescan view to pan coupling between bottom of 6-inch casing and cement basket; no abnormalities noted.
28:37	571', bottom of cement basket.
29:05	Resume downhole view, hole nearly circular, water clear.
31:22	600', hole nearly circular, water clear.
34:11	650', hole nearly circular, water clear.
37:08	700', hole nearly circular, water generally clear.
40:04	750', hole nearly circular, water clear.
44:26	759', hole slightly ovate, water clear, some vugs.
45:48	776', prominent
43:00	800', hole moderately ovate, water clear.
45:57	850', hole nearly circular, water clear.
48:34	887' 04", bottom of hole.
48:50	Switch to sidescan view, start ascent, video dark and frequently distorted.
52:52	851' 08" severe distortion of video.
52:58	850' 07" video restored.
55:09	848' 08", thin (~1"), wavy lignitic? parting.
53:47	845' 04", switch to downhole view.
53:49	845' 01", switch back to sidescan view.
54:49	837' 02", minor vugs and fractures, all strata below this appeared tight.
58:44	787' 05" prominent horizontal fracture/bedding surface comparable to 778' 10" in MW-18, all strata between this level and 837' 02" appear tight.
1:00:04	778' 00" thin (~1") lignitic layer.
1:03:34	741' 06" bottom of minor vertical fractures.
1:03:38	740' 04" top of minor vertical fractures, also apparently abundant *Lepidocyclina*.
1:06:42	679' 07", switch to downhole view, much distortion.
1:06:45	679' 02", switch back to sidescan.
1:07:27	665' 01" minor fractures.
1:08:07	655' 11", switch to downhole view.
1:08:08	655' 05", switch back to sidescan.
1:09:42	623' 10", switch to downhole view.

ENTRIX

Down to Earth. Down to Business.

Video Log

Start Log Time: 11:14
End Log Time: 12:52

Date:	1/7/2010
Project Name:	ASR Floridan Aquifer Monitor Well Construction
Project No.:	00061013.00
Witnessed By:	Donald J. Lee, P.G. (DJL) Karen L. Cheney, P.G.
Transcribed by:	Curtis R. Klug
Well:	MW-19

Elapsed Time	Description of Activities
1:09:47	622' 06" switch to sidescan view.
1:11:19	597' 03" some vugs > 1" in diameter.
1:11:28	594' 07" bottom of minor diagonal fractures.
1:11:31	593' 05" top? of minor diagonal fractures.
1:11:53	586' 09" vuggy to rubbly.
1:14:20	571' 06" bottom of coupling below cement baskets.
1:14:41	570' 07" switch to downhole view.
1:14:47	568' 11" lighting lost.
1:14:49	568' 05" lighting restored but video distorted.
1:14:53	567' 07" switched to sidescan view, poorly focused.
1:15:42	561' 08" bottom of casing joint #28 panned, no problems noted.
1:17:23	541' 09" bottom of casing joint #27 panned, no problems noted.
1:19:19	522' 01" bottom of casing joint #26 panned, no problems noted.
1:19:39	End video.

APPENDIX 4.1

Lithologic Log of MW-19

ENTRIX
Down to Earth. Down to Business.™

Lithology Log (Draft)
(Drill Cuttings)

Date: 11/12/09 - 12/15/09
Project Name: ASR Floridan Aquifer Monitor Well Construction
Job No.: 00061013.00
Well No.: MW-19
Drilling Method: Mud Rotary
Bit Size: Nominal 12-inch
Sampling Method: Continuous (bagged at 10')
Described By: G. Susdorf, K. Cheney, D. Lee, C. Klug

Depth Interval (feet bpl)	Thickness (feet)	Sample Description
0-40	40	No samples collected due to previous disturbance of sediments with cable tool following installation of surface casing.
40-65	25	Shell, yellowish gray (5Y 8/1) to light greenish gray (5GY 8/1); common clay, light greenish gray (5GY 8/1) to greenish gray (5GY 6/1); common quartz sand, very fine to fine, subangular; common phosphate sand, very fine to fine, subrounded; poor intergranular porosity.
65-75	10	Shell, yellowish gray (5Y 8/1) to light greenish gray (5GY 8/1); minor clay, light greenish gray (5GY 8/1) to greenish gray (5GY 6/1); common to abundant quartz sand, very fine to fine, subangular; common phosphate sand, very fine to fine, subrounded; poor intergranular porosity.
75-78	3	Shell, yellowish gray (5Y 8/1) to light greenish gray (5GY 8/1); common clay, light greenish gray (5GY 8/1) to greenish gray (5GY 6/1); common quartz sand, very fine to fine, subangular; common phosphate sand, very fine to fine, subrounded; poor intergranular porosity.
78-80	2	Silty Clay, light olive gray (5Y 6/1), soft, sticky; abundant quartz sand, very fine to fine, subangular; minor shell; common phosphate sand, very fine to fine, subrounded.
80-90	10	Clayey Sand, light greenish gray (5GY 8/1) to greenish gray (5GY 6/1); common shell; minor phosphate sand, very fine to fine, subrounded; trace coral; poor intergranular porosity.
90-100	10	Sandstone, light olive gray (5Y 6/1), poorly indurated; abundant quartz sand, very fine to coarse, subangular to rounded; common shell; minor phosphate sand, very fine to fine; poor to moderate apparent permeability.

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Lithology Log (Draft)
(Drill Cuttings)

Date: 11/12/09 - 12/15/09
Project Name: ASR Floridan Aquifer Monitor Well Construction
Job No.: 00061013.00
Well No.: MW-19
Drilling Method: Mud Rotary
Bit Size: Nominal 12-inch
Sampling Method: Continuous (bagged at 10')
Described By: G. Susdorf, K. Cheney, D. Lee, C. Klug

Depth Interval (feet bpl)	Thickness (feet)	Sample Description
100-110	10	Sandstone, light olive gray (5Y 6/1), poorly indurated (increasing induration with depth); abundant quartz sand, very fine to coarse, subangular to rounded; common shell; minor phosphate sand, very fine to coarse; minor light olive gray (5Y 6/1) sandy clay at base of interval; poor to moderate apparent permeability.
110-120	10	Sandstone, light olive gray (5Y 6/1), poorly indurated; abundant quartz sand, very fine to fine, subangular; minor shell; minor phosphate sand, very fine to fine, subrounded; poor intergranular porosity.
120-130	10	Sandstone, light olive gray (5Y 6/1), poorly indurated; abundant quartz sand, very fine to fine, subangular; calcitic; abundant aragonitc and calcitic mollusk shell including *Dentalium* sp. and *Chicoreus*? sp.; common phosphate sand, very fine to fine, subrounded; poor intergranular porosity.
130-140	10	Sand, light olive gray (5Y 6/1), abundant quartz, silt to fine, subangular; abundant aragonitc and calcitic mollusk shell including *pectinids*; common phosphate sand, very fine to coarse, subrounded; poor intergranular porosity.
140-150	10	Sand, grayish olive (10Y 4/2), abundant quartz, silt to fine, subangular; abundant phosphate sand, very fine to fine, subrounded; common white mica (muscovite?), poor intergranular porosity.
150-170	20	Sand, grayish olive (10Y 4/2), abundant quartz, silt to fine, subangular; abundant phosphate sand, very fine to fine, subrounded; common white mica (muscovite?), fossiliferous including common aragonitic mollusk shell fragments; poor intergranular porosity.
170-200	30	Silt, olive gray (5Y 3/2), soft; moderately clayey, common quartz sand, very fine.

ENTRIX
Down to Earth. Down to Business.

Lithology Log (Draft)
(Drill Cuttings)

Date: 11/12/09 - 12/15/09
Project Name: ASR Floridan Aquifer Monitor Well Construction
Job No.: 00061013.00
Well No.: MW-19
Drilling Method: Mud Rotary
Bit Size: Nominal 12-inch
Sampling Method: Continuous (bagged at 10')
Described By: G. Susdorf, K. Cheney, D. Lee, C. Klug

Depth Interval (feet bpl)	Thickness (feet)	Sample Description
200-210	10	Sand, olive gray (5Y 3/2), abundant quartz, very fine to medium, subangular to subrounded; abundant phosphate sand, very fine to fine, subrounded; fossiliferous including common aragonitic and calcitic mollusk shell fragments, common foraminifers; poor intergranular porosity.
210-220	10	Silt, olive gray (5Y 3/2), soft; slightly clayey, common quartz sand, very fine; common foraminifera including *Bulimina* sp.
220-245	25	Clay, grayish olive (10Y 4/2), soft, sticky, very silty to sandy but somewhat sandier than 143 - 200; abundant quartz silt to very fine sand, subangular; common phosphate silt to very fine sand, subangular to rounded, common shell..
245-277	32	Clay, grayish olive (10Y 4/2), soft, sticky, very silty to sandy; abundant quartz silt to very fine sand, subangular; common phosphate silt to very fine sand, subangular, common shell.
277-278	1	Limestone (?), yellowish gray (5Y 7/2), packstone to grainstone, common quartz, sand-silt sized, common fine phosphate.
278-283	5	Clay, grayish olive (10Y 4/2), soft, sticky, very silty to sandy, abundant quartz silt to very fine sand, subangular, common phosphate silt to very fine sand, subangular, abundant shell.
283-323	40	Clay, grayish olive (10Y 4/2), soft, sticky, very silty to sandy; abundant quartz silt to very fine sand, subangular; common phosphate silt to very fine sand, subangular, trace shell.
323-335	12	Clay, grayish olive (10Y 4/2), soft, sticky, very silty to sandy, siltier than 283-323, abundant quartz silt to very fine sand, subangular, common phosphate silt to very fine sand, subangular, trace shell.
335-339	4	Limestone, yellowish gray (5Y 8/1), packstone, poorly indurated, common fine phosphate, calcitic, poor interparticle porosity.
339-341	2	Clay, greenish gray (5GY 6/1), soft, sticky, very silty to sandy; abundant quartz silt to very fine sand, subangular; common phosphate silt to very fine sand, subangular.

ENTRIX
Down to Earth. Down to Business.℠

Lithology Log (Draft)
(Drill Cuttings)

Date: 11/12/09 - 12/15/09
Project Name: ASR Floridan Aquifer Monitor Well Construction
Job No.: 00061013.00
Well No.: MW-19
Drilling Method: Mud Rotary
Bit Size: Nominal 12-inch
Sampling Method: Continuous (bagged at 10')
Described By: G. Susdorf, K. Cheney, D. Lee, C. Klug

Depth Interval (feet bpl)	Thickness (feet)	Sample Description
341-363	22	Clay, greenish gray (5GY 6/1), soft, sticky, very silty to sandy; abundant quartz silt to very fine sand, subangular; common phosphate silt to very fine sand, subangular, common shell.
363-370	7	Clay, greenish gray (5GY 6/1), soft, sticky, very silty to sandy, abundant quartz silt to very fine sand, subangular, siltier than 341-363, common phosphate silt to very fine sand, subangular, trace shell.
370-375	5	Clay, dark greenish gray (5GY 4/1), soft, sticky, very silty to sandy; abundant quartz silt to very fine sand, subangular; more silt than sand, common phosphate silt to very fine sand, subangular, trace shell.
375-377	2	Clay, pale olive (10Y 6/2), soft, sticky, very silty to sandy; abundant quartz silt to very fine sand, subangular; common phosphate silt to very fine sand, subangular.
377-380	3	Clay, pale olive (10Y 6/2), soft, sticky, very silty to sandy; abundant quartz silt to very fine sand, subangular; common phosphate silt to very fine sand, subangular, common shell.
380-382	2	Clay, dark greenish gray (5GY 4/1), soft, sticky, very silty to sandy, abundant quartz silt to very fine sand, subangular, common phosphate silt to very fine sand, subangular, common shell.
382-385	3	Clay, pale olive (10Y 6/2), soft, sticky, very silty to sandy, abundant quartz silt to very fine sand, subangular, common phosphate silt to very fine sand, subangular, abundant shell.
385-395	10	Clay, dark greenish gray (5GY 4/1), soft, sticky, very silty to sandy, abundant quartz silt to very fine sand, subangular, common phosphate silt to very fine sand, subangular, common shell.
395-401	6	Clay, pale olive (10Y 6/2), soft, sticky, very silty to sandy, abundant quartz silt to very fine sand, subangular, minor phosphate silt to very fine sand, subangular, common shell.

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Depth Interval (feet bpl)	Thickness (feet)	Sample Description
401-415	14	Clay, yellowish gray (5Y 7/2) to pale olive (10Y 6/2), soft, sticky, very silty to sandy; more silty than sandy, abundant quartz silt to very fine sand, subangular; abundant phosphate very fine to coarse, subangular, common shell.
415-420	5	Clay, pale olive (10Y 6/2) to grayish olive (10Y 4/2), soft, sticky, very silty to sandy, abundant quartz silt to very fine sand, subangular; abundant phosphate silt to very fine sand, subangular, minor phosphate, coarse sand, subangular, common
420-423	3	Clay, grayish olive (10Y 4/2), soft, sticky, very silty to sandy, abundant quartz silt to very fine sand, subangular, common phosphate silt to very fine sand, subangular, common shell.
423-424	1	Mudstone, pale olive (10Y 6/2) to yellowish gray (5y 7/2), well indurated, poor interparticle porosity.
424-430	6	Clay, pale olive (10Y 6/2), soft, sticky, very silty to sandy, abundant quartz silt to very fine sand, subangular, common phosphate silt to coarse sand, subangular, common shell.
430-437	7	Clay, yellowish gray (5Y 7/2) to pale olive (10Y 6/2), soft, sticky, very silty to sandy; more silty than sandy, abundant quartz silt to very fine sand, subangular; common phosphate very fine to coarse sand, subangular, common shell.
437-443	6	Clay, grayish olive (10Y 4/2), soft, sticky, very silty to sandy, abundant quartz silt to very fine sand, subangular, common phosphate silt to coarse sand, subangular, common shell.
443-445	2	Clay, yellowish gray (5Y 7/2), soft, sticky, very silty to sandy, abundant quartz silt to very fine sand, subangular, common phosphate, very silty to fine sand, common shell, minor siltstone.
445-450	5	Clay, pale olive (10Y 6/2), soft, sticky, silty to sandy, more silt than sand, abundant quartz silt to very fine sand, subangular, common phosphate, very silty to coarse sand, common shell.

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Depth Interval (feet bpl)	Thickness (feet)	Sample Description
450-460	10	Clay, dark greenish gray (5GY 4/1), soft, sticky, very silty to sandy, more silt than sand, abundant quartz silt to very fine sand, subangular, minor phosphate silt to very fine sand, subangular.
460-473	13	Clay, grayish olive (10Y 4/2), soft, sticky, very silty to sandy, abundant quartz silt to very fine sand, subangular, common phosphate, very silty to very fine sand, subangular, common shell.
473-475	2	Clay, yellowish gray (5Y 7/2), soft, sticky, very silty to sandy, abundant quartz silt to very fine sand, subangular, common phosphate, very silty to coarse sand, common shell.
475-478	3	Clay, pale olive (10Y 6/2), soft, sticky, very silty to sandy, abundant quartz silt to very fine sand, subangular, common phosphate, very silty to very fine sand, subangular, common shell.
478-495	17	Clay, yellowish gray (5Y 7/2), soft, sticky, very silty to sandy, abundant quartz silt to very fine sand, subangular, common phosphate, very fine sand, subangular, minor shell.
495-501	6	Clay, grayish olive (10Y 4/2), soft, sticky, very silty to sandy, abundant quartz silt to very fine sand, subangular, minor phosphate, fine sand, subangular, minor shell.
501-510	9	Clay, pale olive (10Y 6/2), soft, sticky very silty to sandy, abundant quartz silt to very fine sand, subangular, minor phosphate, fine to coarse sand, common shell.
510-523	13	Clay, yellowish gray (5Y 7/2), soft, sticky very silty to sandy, abundant quartz silt to very fine sand, subangular, common phosphate, fine to coarse sand, common shell.
523-530	7	Limestone (50%), light gray (N7), wackestone (sparse biomicrite), well indurated, common shell fragments, quartz and phosphorite, poor intergranular porosity. Clay (50%), light gray (N7), silty, fine to very fine quartz and phosphorite sand, shell fragments.

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Depth Interval (feet bpl)	Thickness (feet)	Sample Description
530-535	5	Limestone (75%), light gray (N7), wackestone (biomicrite), well indurated, common shell fragments and phosphorite, poor intergranular porosity. Clay (25%), as above.
535-543	8	Clay, grayish olive (10Y 4/2), soft, sticky, soft, sticky, very silty to sandy, abundant quartz silt to very fine sand, subangular, common phosphate, silty to very fine sand, subangular, minor shell.
543-544	1	Limestone, light gray (N7), mudstone (micrite), well indurated, common quartz, phosphatic, poor interparticle porosity, shell.
544-550	10	Sandstone (80% cuttings , dolomitic, light olive gray (5Y 5/2), silt to very fine quartz and phosphorite sand, subangular to rounded; some siltstone, moderately hard, mollusks, shell fragments, molds, Limestone, white, packstone, hard, fine to medium phosphorite well rounded
550-560	10	Limestone, yellowish gray (5Y 8/1), packstone (sparse to packed biomicrite), coarse to fine allochems, hard drilling, common phosphorite, rutile, mollusks, well cemented, very little intergranular porosity. Trace amount dolostone, light olive gray (5Y 6/1) to olive gray (5Y 4/1), fine phosphorite and rutile, well rounded.
560-570	10	Limestone, yellowish gray (5Y 8/1), packstone (packed biomicrite), coarse to fine allochems, hard drilling, trace phosphorite, abundant mollusks, abundant forams including *Lepidocyclina* sp., echinoid spines, well cemented, little intergranular porosity.
570-600	30	Limestone, yellowish gray (5Y 8/1 to 5Y 7/1), packstone (packed biomicrite), coarse to fine allochems, hard drilling, well cemented, abundant mollusks, abundant forams including *Lepidocyclina* sp and possibly *Nummulites* sp., echinoid spines, trace dark mineral possibly phosphorite <5%, very little intergranular porosity.

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Depth Interval (feet bpl)	Thickness (feet)	Sample Description
600-670	70	Limestone, yellowish gray (5Y 7/1), packstone (poorly washed biopelsparite), coarse to fine allochems, hard drilling, well cemented, abundant mollusks, abundant forams including *Lepidocyclina* sp. and possibly *Nummulites* sp., echinoid spines, good intergranular porosity.
670-680	10	Limestone, very pale orange (10YR 8/2), packstone (packed biopelmicrite), poorly indurated, abundant *Lepidocylina* sp., *Nummulites* sp., *Amphistegina* sp., *Durhamella ocalana*, good intergranular porosity.
680-750	70	Limestone, very pale orange (10YR 8/2), packstone, poorly indurated, very abundant *Nummulites* sp., *Lepidocylina* sp., *Amphistegina* sp., *Durhamella ocalana*, bryozoans, mollusk fragments, good intergranular porosity
750-770	20	Limestone, very pale orange (10YR 8/2), packstone (packed biopelmicrite), poorly indurated, clay balls, abundant *Neolaganum dalli*, *Nummulites* sp., *Lepidocylina* sp., *Amphistegina* sp., mollusk fragments, good intergranular porosity.
770-790	20	Limestone, as above, decreasing echinoid content.
790-800	10	Limestone, very pale orange (10YR 8/2), packstone (sorted biopelsparite), poorly indurated, trace *Neolaganum dalli* sp. and *Nummulites* sp., abundant *Lepidocylina* sp., poor to moderate intergranular porosity
800-810	10	Limestone, very pale orange (10YR 8/2), packstone to grainstone (packed biopelmicrite), poorly indurated, more abundant *Neolaganum dalli*, common *Dictyoconus* sp., *Nummulites* sp. and *Lepidocylina* sp., moderate to good intergranular porosity and pin
810-820	10	Limestone, very pale orange (10YR 8/2), packstone to grainstone (packed biopelmicrite), poorly indurated, abundant *Neolaganum dalli* 8-10 mm, trace *Lepidocylina* sp., trace *Dictyconus* sp., moderate to good intergranular porosity and pin point vugular

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Depth Interval (feet bpl)	Thickness (feet)	Sample Description
820-840	20	Limestone, very pale orange (10YR 8/2), packstone (packed biopelmicrite), poorly indurated, clayey, yellowish gray (5Y 7/2), *Neolaganum dalli*, trace *Dictyconus* sp., razor thin mollusk shell, poor intergranular porosity.
840-850	10	Limestone, very pale orange (10YR 8/2), packstone to grainstone (packed biopelmicrite to poorly washed biopelsparite), poorly indurated, abundant *Neolaganum dalli* 15 mm, trace *Lepidocylina* sp., trace *Dictyconus* sp., poor intergranular porosity.
850-860	10	Limestone, very pale orange (10YR 8/2) to white, packstone (packed biopelmicrite), poorly indurated, echinoids, trace *Lepidocylina* sp., trace *Dictyconus* sp., mollusk shells and fragments, poor intergranular porosity
860-870	10	Limestone, very pale orange (10YR 8/2) to white, packstone (packed biopelmicrite), poorly indurated, *Neolaganum dalli*, trace *Lepidocylina* sp., trace *Dictyconus* sp., mollusk shells and fragments, poor intergranular porosity.
870-890 (TD)	20	Limestone, very pale orange (10YR 8/2) to white, packstone (packed biopelmicrite), poorly indurated, *Neolaganum dalli*, trace *Lepidocylina* sp., trace *Dictyconus* sp., mollusk shells and fragments including *Turritella* sp., moderate intergranular porosity and pin-point vugular porosity.