DOGAMI #503

Schlumberger

DUAL INDUCTION
SP / GAMMA RAY

COUNTY	COLUMBIA
FIELD	MIST GAS STORAGE
LOCATION	N 03-03-15 E 2291.54' & S 86-56-45 E
WELL	IW 22H-22-65
COMPANY	NORTHWEST NATURAL GAS

COMPANY NORTHWEST NATURAL GAS

WELL IW 22H-22-65

FIELD MIST GAS STORAGE

COUNTY: COLUMBIA **STATE:** OREGON

LOCATION
N 03-03-15 E 2291.54' & S 86-56-45 E
1907.87' FROM SW CORNER OF SEC 22

Other Services:
INDUCTION
SONIC
LDT
CNL
GR

API SERIAL NO.	SECT.	TWP.	RANGE
36-009-00323	22	T7 6N	R6 5W

Permanent Datum	GROUND LEVEL	**Elev.**	580.6 F	**Elev.:** **K.B.** 596.6 F
Log Measured From	KELLY BUSHING	16.0 F	**above Perm. Datum**	**D.F.**
Drilling Measured From	KELLY BUSHING			**G.L.** 580.6 F

Date		21-OCT-1997			
Run No.		ONE			
Depth Driller		1825.0 F			
Depth Logger (Schl.)		1820.0 F			
Btm. Log Interval		1810.0 F			
Top Log Interval		0.0 F			
Casing-Driller		13 3/8" @ 332.0 F		@	@
Casing-Logger		332.0 F			
Bit Size		@		@	@
Type Fluid in Hole		LSND			
Dens.	**Visc.**	10.00 LB/G	55.0 S		
pH	**Fld. Loss**	8.0			
Source of Sample		FLOWLINE			
Rm @ Meas. Temp.		2.000 OHMM @ 68.0 DEGF		@	
Rmf @ Meas. Temp.		1.140 OHMM @ 66.0 DEGF		@	
Rmc @ Meas. Temp.		.880 OHMM @ 66.0 DEGF		@	
Source: Rmf	**Rmc**	CELL	CELL		
Rm @ BHT		1.613 OHMM @ 86.0 DEGF		@	
TIME	**Circulation Ended**	15:30 10-21-97			
	Logger on Bottom	SEE LOG			
Max. Rec. Temp.		86.0 DEGF			
Equip.	**Location**	8303	BAKERSFIELD		
Recorded By		GREG PERRY			
Witnessed By		MR. MEYER / MR. THOMAS			

The well name, location and borehole reference data were furnished by the customer.

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 interpretations, and we shall not, except in the case of gross or wilful negligence on our part, be liable or responsible for any loss, costs, damages or expenses incurred or sustained by anyone resulting from any interpretations made by any of our officers, agents or employees. These interpretations are also subject to Clause 4 of our General Terms and Conditions as set out in our current Price Schedule.

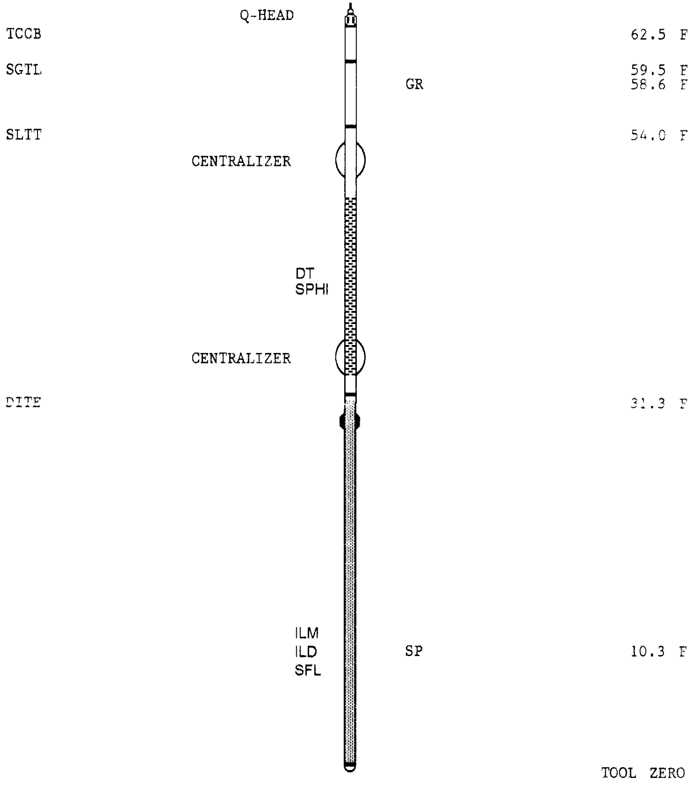
Run No.	ONE			
Service Order No.				
Drilling Fluid Level	0.0 F			
Salinity				
Rmf @ BHT	.895 OHMM	@	86.0 DEGF	@
Rmc @ BHT	.691 OHMM	@	86.0 DEGF	@
Logging Speed	1800.0 F/HR			
EQUIPMENT DATA				
Tool Number 1	DIS 151			
Tool Number 2	DIC 159			
Tool Number 3	SLS			
Tool Number 4	SLC			
Tool Number 5	SGC 483			
Tool Number 6	TCC 1289			
Tool Number 7	LDT 4768			
Tool Number 8	CNL 1345			
Tool Number 9	NSC 2979			
Tool Number 10				
Tool Number 11				
Tool Number 12				

REMARKS:

RAN CENTRALIZERS ON THE INDUCTION AND THE SONIC
TOOL TURNERS RAN ON THE CNL AND THE LDT.
FLEX JOINTS RAN ABOVE THE DIT,SLT AND THE CNL.
DIDNOT TAG UP ON BOTTOM DUE TO TLC PUSHDOWN.

CREW: DAN LEE.
TLC MAN. DAVID BLYTHE.

LOGGING TOOL STRING SKETCH



TOTAL TOOL STRING LENGTH IS 64.7 F.
TOTAL TOOL STRING WEIGHT IS 1032. LB IN AIR.

MAIN PASS

FILES SPLICED	SPLICE DEPTH
82 TO 76	1099.0 F

ACCUMULATED INTEGRATION VALUES SUMMARY:

```
Integrated Transit Time:  .185456 S     FROM 1817.50 F     TO 1.50000 F
Integrated Hole Volume:   1987.42 F3    FROM 1817.50 F     TO 1.50000 F
Integrated Cement Volume: 1242.00 F3    FROM 1817.50 F     TO 1.50000 F
  (ASSUMING 8.67500 IN   O.D. CASING)
```

EVENT MARK SUMMARY:

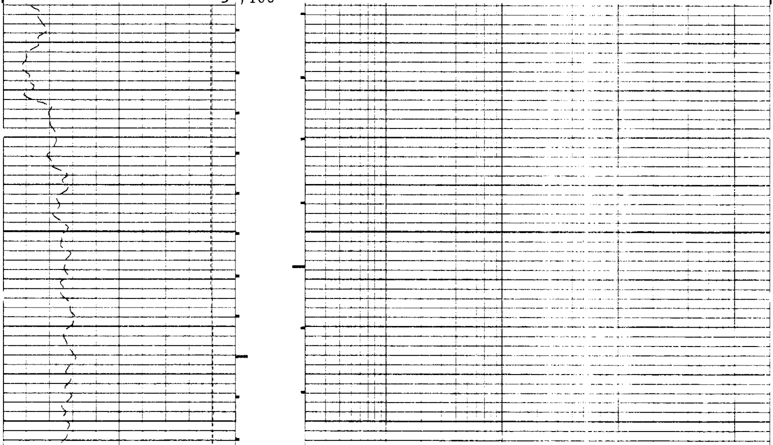
OUTPUT	INTERVAL BETWEEN PIPS	DEPTH TRACK EDGE
Integrated Hole Volume	10.0000 F3	LEFT EDGE
Integrated Cement Volume	10.0000 F3	RIGHT EDGE

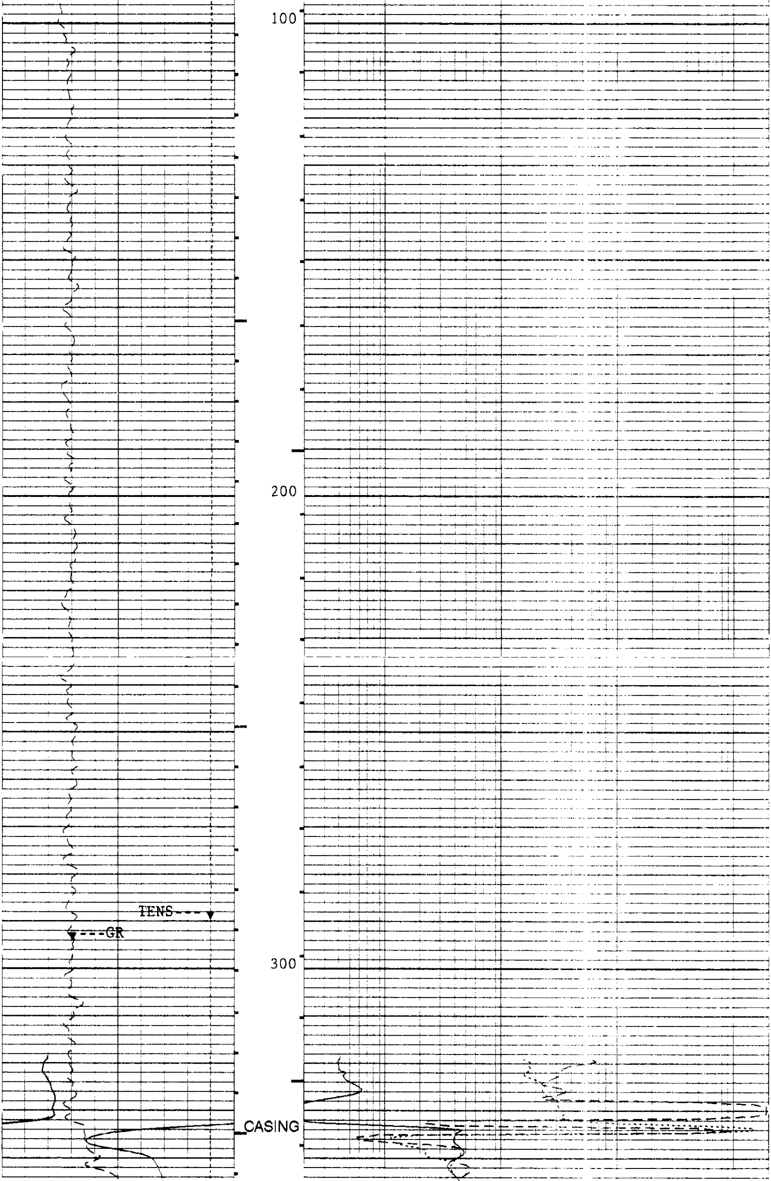
TENS(LBF)
10000. 0.0
GR(GAPI)
0.0 150.00

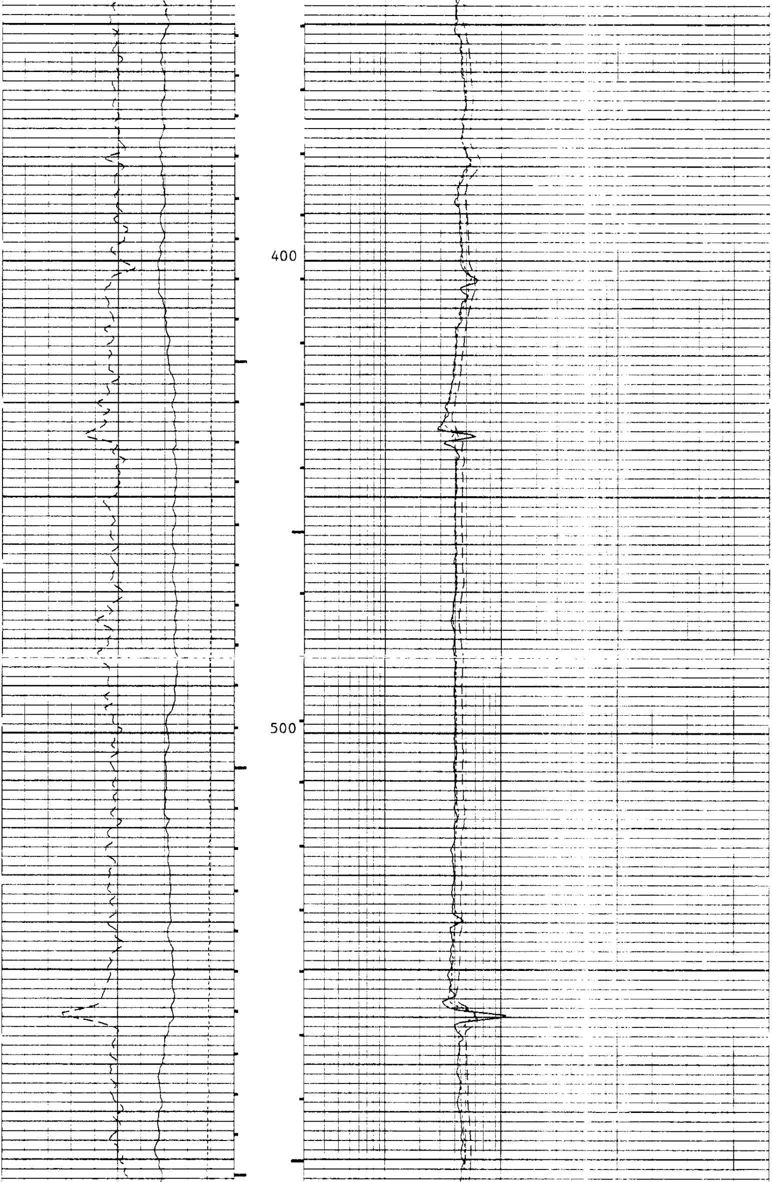
CP 44.2 FILE 86 22-OCT-1997 13:28

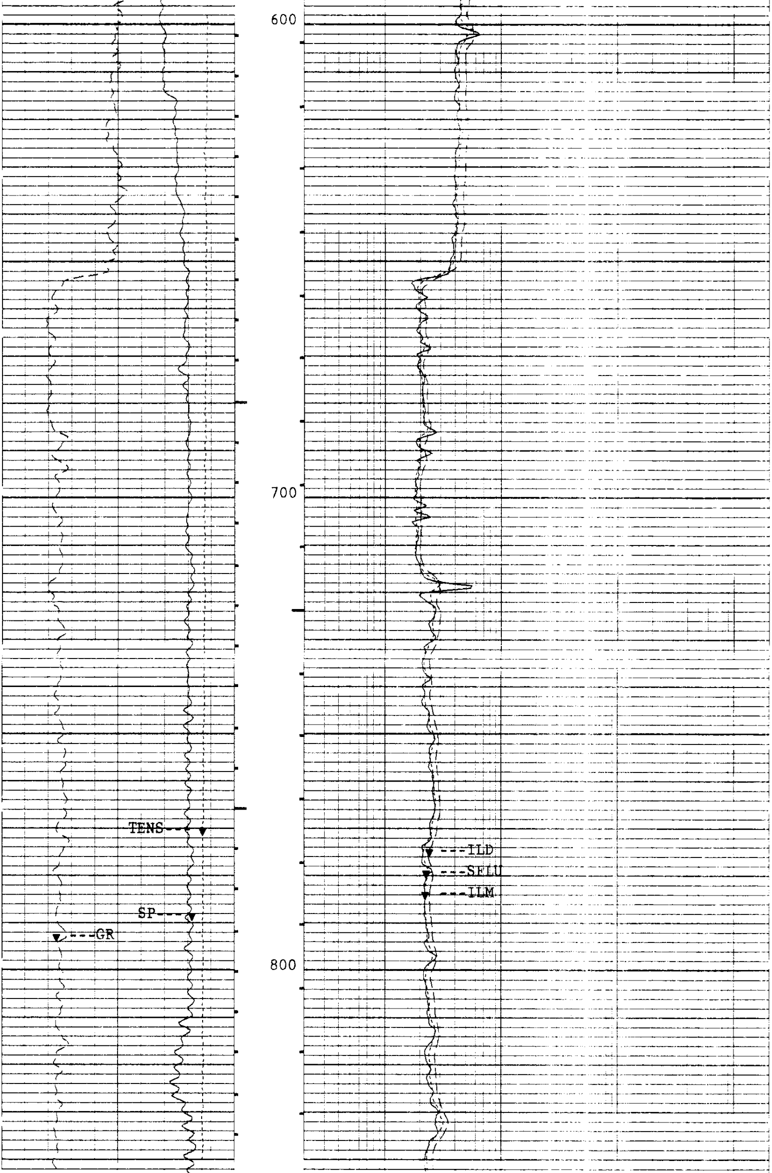
INPUT FILE(S)	CREATION DATE
76	22-OCT-1997 01:31

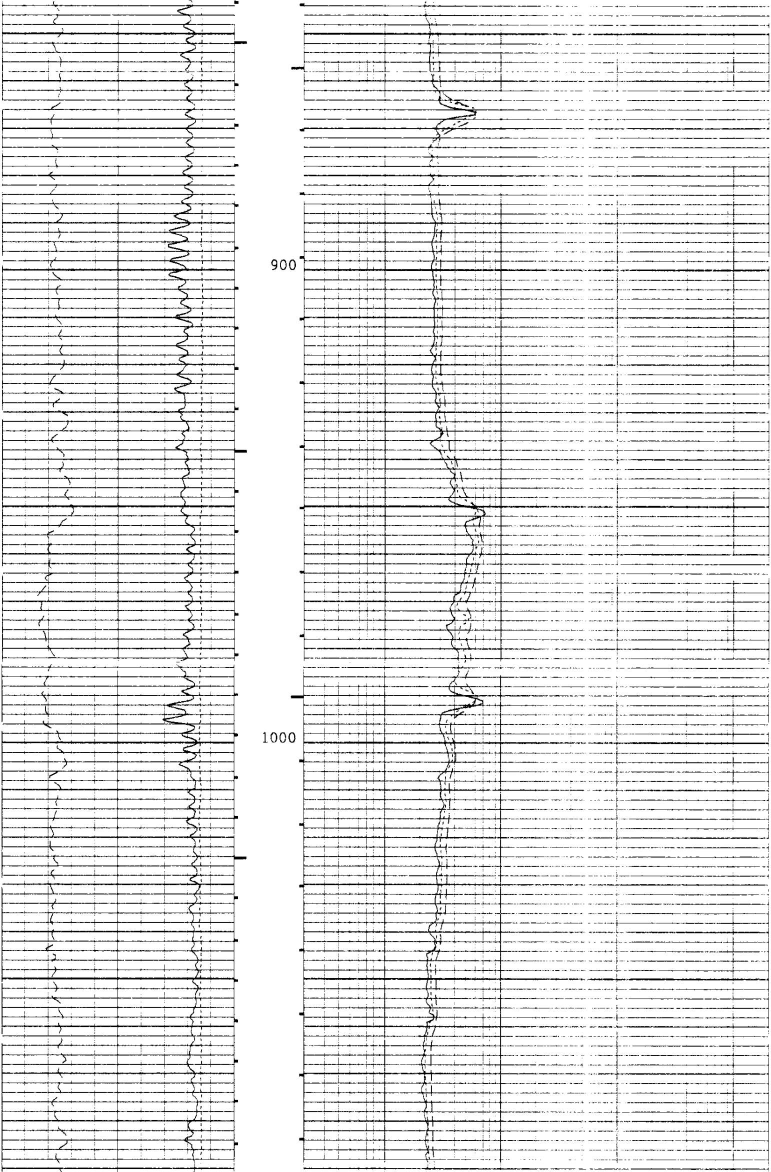
5"/100'

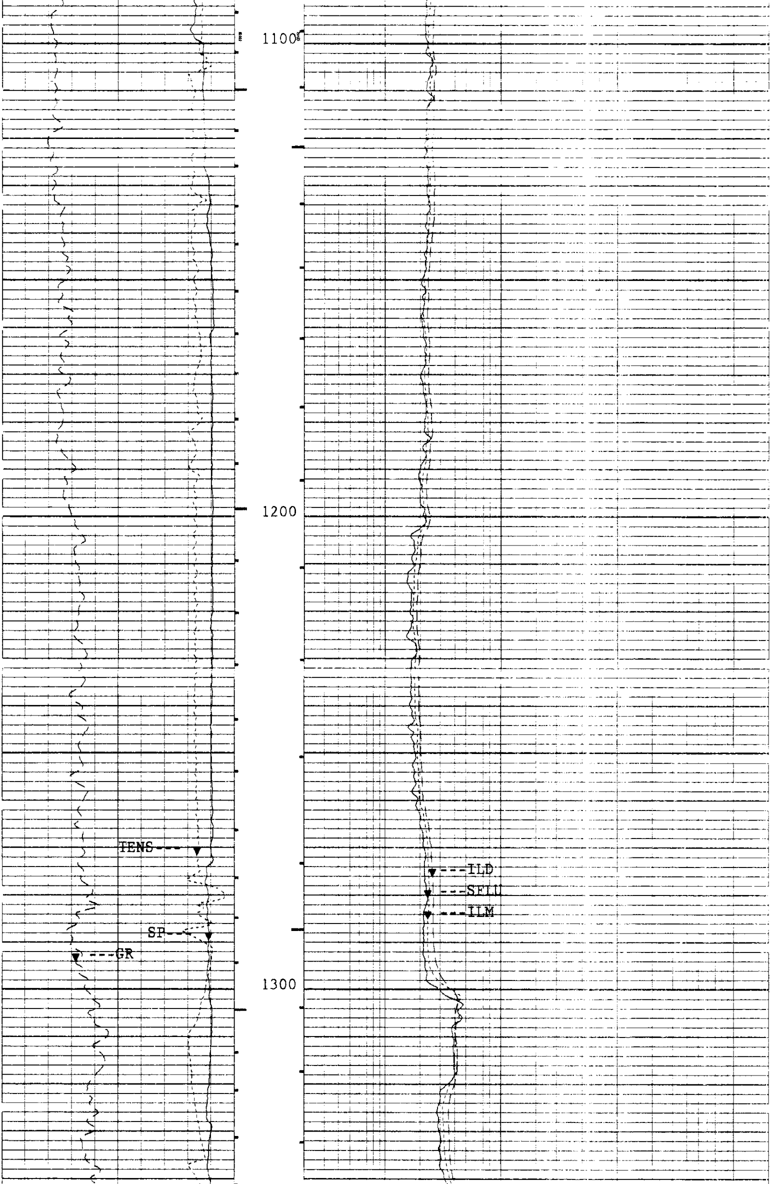


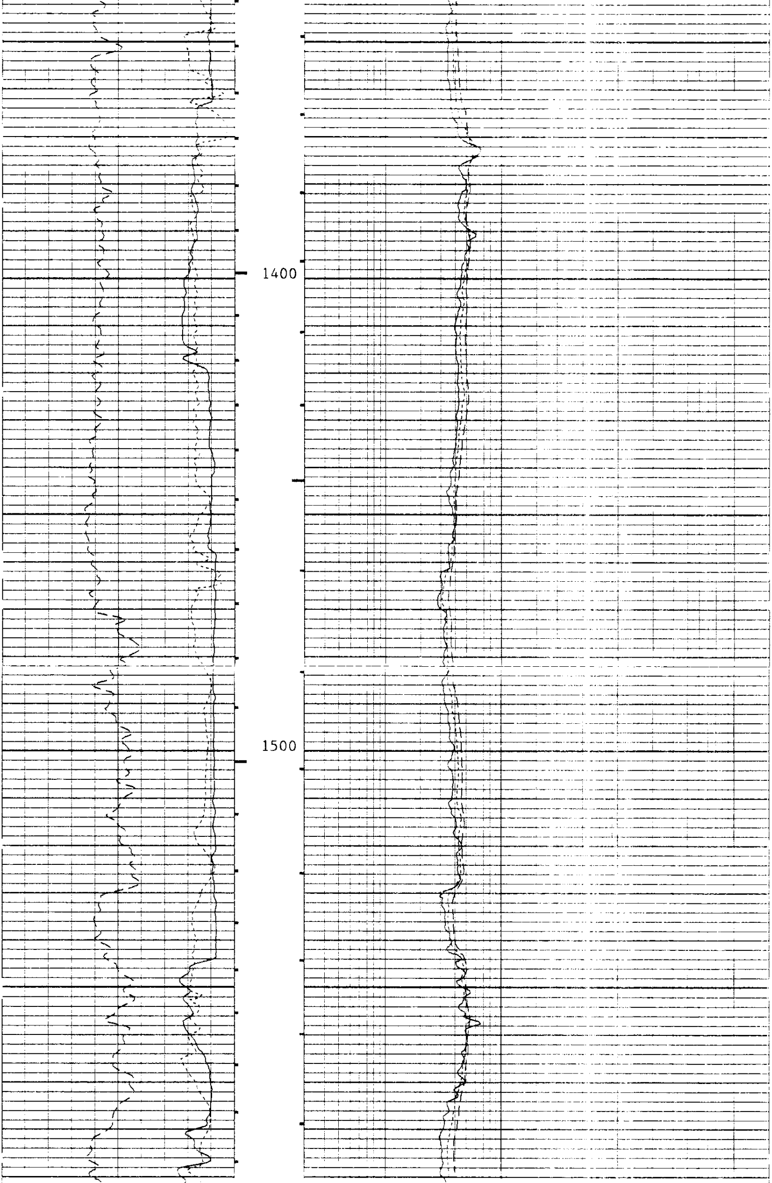


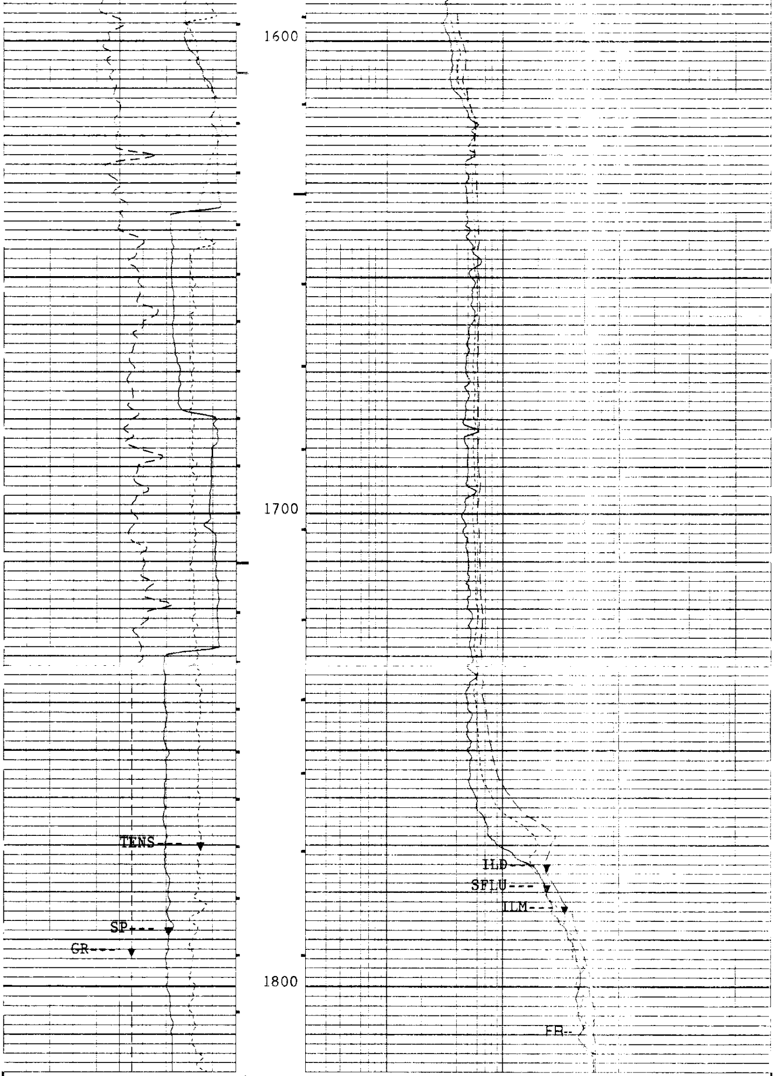












5"/100'

CP 44.2 FILE 86 22-OCT-1997 13:17

INPUT FILE(S) CREATION DATE
82 22-OCT-1997 12:23

TENS(LBF)	10000.	0.0	ILD(OHMM)	20000	2000.0
SP(MV)	-10.00	90.000	SFLU(OHMM)	20000	2000.0
GR(GAPI)	0.0	150.00	ILM(OHMM)	20000	2000.0

SENSOR MEASURE POINT TO TOOL ZERO

DITE	10.3	FEET	SGIL	89.2	FEET
DTT	3.0	FEET	LDTD	36.0	FEET
AMS	98.4	FEET	CNTH	54.0	FEET
SLTT	68.2	FEET			

PARAMETERS

NAME	VALUE	UNIT	NAME	VALUE	UNIT
SMB	DISA		VDLR	2IN	
TOCA	DISA		RATE	15	HZ
DG	AUTO		DETE	E2	
NMSG	180	US	CBLG	35	US
AMPL	2		CBL	2	
WFM	1		SS	FAST	
TOD	DISA		SLC	UA	
DTF	189.000	US/F	DTM	56.0000	US/F
CDTS	100.000		SPFS	R-H	
PP	NORM		DO	0.0	F
WMUD	10.0000	LB/G	TD	32768.0	F
FCD	8.67500	IN	DHC	BS	
BFM	LIQU		MDEN	2.65000	G/C3
FD	1.00000	G/C3	DPPM	STAN	
MATR	SAND		HC	CALI	
NPDC	0		HSCO	YES	
SOCO	NO		MCCO	NO	
BSCO	NO		FSCO	NO	
MWCO	NO		PTCO	NO	
CCCO	NO		SDAT	SOCN	
MCOR	NATU		SOCN	.500000	IN
FSAL	-50000.0	PPM	ANGL	0.0	DEG
GGRD	.0100000	DF/F	BHFL	WATE	
IFRS	20	KHZ	SBR	1.00000	OHMM
MXE2	39.0062	MM/M	DXE2	124.493	MM/M
MRE2	17.0971	MM/M	DRE2	11.5626	MM/M
MPH2	-1.08185	DEG	DPH2	-.001757	DEG
MGF2	1.05831		DGF2	1.00935	
DESP	DISA		SFLE	ALLO	
DCAS	-50000.0	F	ITEN	ALLO	
DEVI	80.0000	DEG	DSES	H48	
IPRO	STAN		IPHA	NORM	
DWCO	512		DSIN	5	US
DDEL	200	US	CDSE	RHOB	
CNPS	NPHI		NCJT	GSRY	
GTSE	TEMP		SHT	55.0000	DEGF
BHT	86.0000	DEGF	DTCI	0.0	F
SPAE	DISA		DFD	10.0000	LB/G
RMFS	1.14000	OHMM	MFST	66.0000	DEGF
BS	12.2500	IN	BHS	OPEN	

REPEAT SECTION

ACCUMULATED INTEGRATION VALUES SUMMARY:

```
Integrated Transit Time:  .0320768 S    FROM 1120.00 F    TO 900.000 F
Integrated Hole Volume:   180.061 F3    FROM 1120.00 F    TO 900.000 F
Integrated Cement Volume: 89.7613 F3    FROM 1120.00 F    TO 900.000 F
  (ASSUMING 8.67500 IN   O.D. CASING)
```

EVENT MARK SUMMARY:

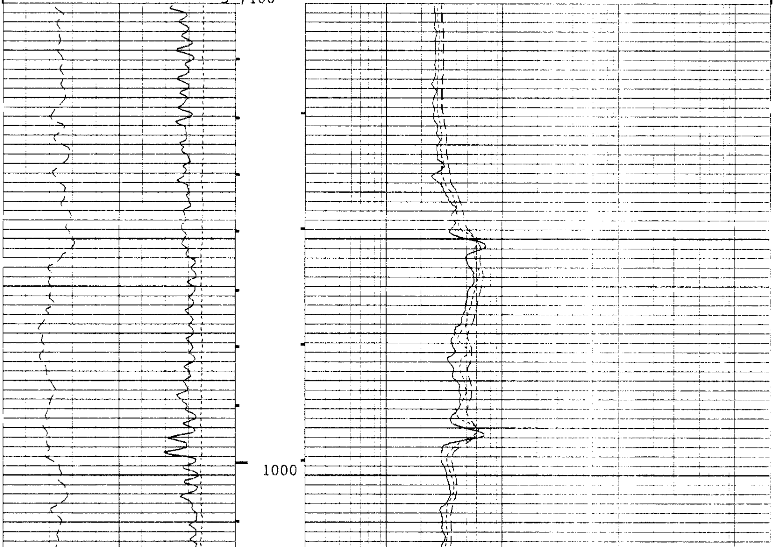
OUTPUT	INTERVAL BETWEEN PIPS	DEPTH TRACK EDGE
Integrated Hole Volume	10.0000 F3	LEFT EDGE
Integrated Cement Volume	10.0000 F3	RIGHT EDGE

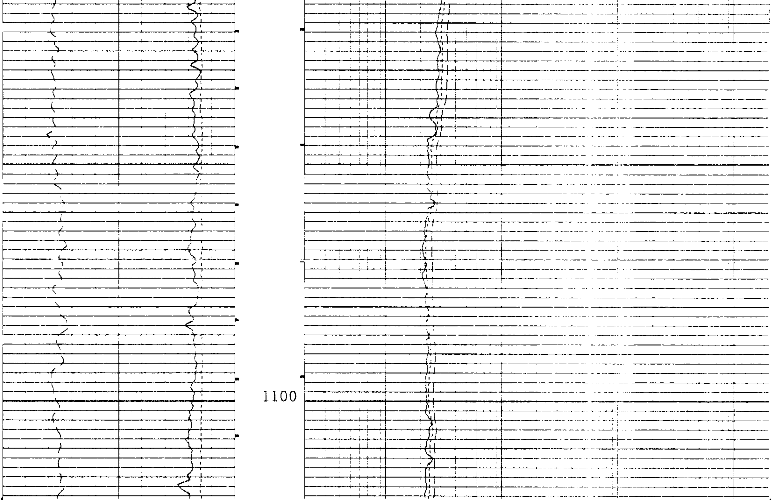
Curve	Left	Right
TENS(LBF)	10000.	0.0
SP(MV)	-10.00	90.000
GR(GAPI)	0.0	150.00
ILD(OHMM)	.20000	2000.0
SFLU(OHMM)	.20000	2000.0
ILM(OHMM)	.20000	2000.0

```
CP 44.2          FILE   88        22-OCT-1997 13:33

                 INPUT FILE(S)    CREATION DATE
                      76          22-OCT-1997 01:31
```

5"/100'





5"/100'

CP 44.2 FILE 88 22-OCT-1997 13:32

INPUT FILE(S) 76

CREATION DATE 22-OCT-1997 01:31

TENS(LBF)			ILD(OHMM)	
10000.	0.0		.20000	2000.0
SP(MV)			SFLU(OHMM)	
-10.00	90.000		.20000	2000.0
GR(GAPI)			ILM(OHMM)	
0.0	150.00		.20000	2000.0

SENSOR MEASURE POINT TO TOOL ZERO

DITE	10.3	FEET	SGTL	89.2	FEET
DTT	3.0	FEET	LDTD	36.0	FEET
AMS	98.4	FEET	CNTH	54.0	FEET
SLTT	68.2	FEET			

PARAMETERS

NAME	VALUE	UNIT	NAME	VALUE	UNIT
SMB	DISA		VDLR	2IN	
TOCA	DISA		RATE	15	HZ
DG	AUTO		DETE	E2	
NMSG	180	US	CBLG	35	US
AMPL	2		CBL	2	
WFM	1		SS	FAST	
TOD	DISA		SLC	UA	
DTF	189.000	US/F	DTM	56.0000	US/F
CDTS	100.000		SPFS	R-H	

```
     PP   NORM                        DO   0.0          F
     WMUD 10.0000     LB/G            TD   32768.0      F
     FCD  8.67500     IN              DHC  BS
     BFM  LIQU                        MDEN 2.65000      G/C3
     FD   1.00000     G/C3            DPPM STAN
     MATR SAND                        HC   CALI
     NPDC 0                           HSCO YES
     SOCO NO                          MCCO NO
     BSCO NO                          FSCO NO
     MWCO NO                          PTCO NO
     CCCO NO                          SDAT SOCN
     MCOR NATU                        SOCN .500000      IN
     FSAL -50000.0    PPM             ANGL 0.0          DEG
     GGRD .0100000    DF/F            BHFL WATE
     IFRS 20          KHZ             SBR  1.00000      OHMM
     MXE2 39.0062     MM/M            DXE2 124.493      MM/M
     MRE2 17.0971     MM/M            DRE2 11.5626      MM/M
     MPH2 -1.08185    DEG             DPH2 -.001757     DEG
     MGF2 1.05831                     DGF2 1.00935
     DESP DISA                        SFLE ALLO
     DCAS -50000.0    F               ITEN ALLO
     DEVI 80.0000     DEG             DSES H48
     IPRO STAN                        IPHA NORM
     DWCO 512                         DSIN 5            US
     DDEL 200         US              CDSE RHOB
     CNPS NPHI                        NCJT GSRY
     GTSE TEMP                        SHT  55.0000      DEGF
     BHT  86.0000     DEGF            DTCI 0.0          F
     SPAE DISA                        DFD  10.0000      LB/G
     RMFS 1.14000     OHMM            MFST 66.0000      DEGF
     BS   12.2500     IN              BHS  OPEN
```

CALIBRATIONS

```
                BEFORE SURVEY CALIBRATION Summary


   Performed:     21-OCT-1997 18:25
   Program File: TOH     (Version    44.2    95/07/25  95/07/25)


 SGTL            Detector Calibration Summary

              MEASURED
            BKGD     JIG            CALIBRATED           UNITS
    GR       35      192               165               GAPI

 Back: 29-AUG-1997 10:04   Jig: 29-AUG-1997 10:08  Comp: 29-AUG-1997 10:08


 DITE            Electronics Calibration Summary

 Sonde SN#: 151
 Cartridge SN#: 159
 Induction Freq: 20  KHz

 Induction Electronics:

      Offset    Valid Range     Gain   Valid Range      Phase   Valid Range
      (MM/M )     (MM/M )       (--)      (---)        (DEG.)     (DEG.)

   IRD     7.9 -117. => 133.    .984    .84 => 1.18
```

```
  IXD   20.3 -105. => 145.    .991   .84 => 1.19    8.55  -5.89 => 24.11
  IRM   25.8 -199. => 251.    .996   .85 => 1.20
  IXM     .1 -224. => 226.    .956   .81 => 1.15    8.05  -6.49 => 23.51

SFL Electronics:

       Offset  Valid Range    Units      Gain  Valid Range

  SFV     .4  -14.5 => 15.5    MV         .98  .84 => 1.19
  SFC    -.0     -.6 =>  .6    MA         .98  .84 => 1.18

Plus Measurement performed at: 21-OCT-1997 18:24

Shop cals used were performed: 29-AUG-1997 11:39

   CP 44.2            FILE    0      21-OCT-1997 18:25



                SHOP Summary


  Performed:    20-OCT-1997 09:46
  Program File: CCSHOP (Version    44.2    95/07/25  95/07/25)


DITE            Calibration Summary

Sonde Serial Number: 151
Cartridge Serial Number: 159


                        SHOP CONSTANTS

Test Loop Calibration:  Calibration of internal reference
                        to test loop standard


        Cons.   Gain    Valid Range     Cons.   Phase   Valid Range
                (---)      (---)               ( DEG )    ( DEG )

10KHz:
  ILD:  DGF1     .999   .900 => 1.100   DPH1      .15  -1.50 =>  1.50
  ILM:  MGF1    1.054   .900 => 1.100   MPH1     -.32  -1.50 =>  1.50

20KHz:
  ILD:  DGF2    1.009   .900 => 1.100   DPH2     -.00  -2.00 =>  2.00
  ILM:  MGF2    1.058   .900 => 1.100   MPH2    -1.08  -3.00 =>  1.00

40KHz:
  ILD:  DGF4    1.023   .900 => 1.100   DPH4    -1.09  -4.00 =>  2.00
  ILM:  MGF4    1.083   .900 => 1.100   MPH4    -2.65  -5.00 =>  1.00


Sonde Error Corrections:  Correction for sonde response in Zero
                          Conductivity Environments

            Cons.  Sonde Error    Valid Range
                   Correction
                     (MM/M )        (MM/M )

10KHz:
  IRD SEC:  DRE1       31.60      -50.0 => 125.0
  IXD SEC:  DXE1      221.33     -250.0 => 350.0
  IRM SEC:  MRE1       63.89      -50.0 => 140.0
  IXM SEC:  MXE1       27.25    -1300.0 =>1300.0
```

```
20KHz:
  IRD SEC:  DRE2       11.56      -30.0 =>  30.0
  IXD SEC:  DXE2      124.49     -125.0 => 200.0
  IRM SEC:  MRE2       17.10      -50.0 =>  50.0
  IXM SEC:  MXE2       39.01     -650.0 => 650.0

40KHz:
  IRD SEC:  DRE4        1.24      -15.0 =>  15.0
  IXD SEC:  DXE4       79.27      -75.0 => 125.0
  IRM SEC:  MRE4        3.45      -30.0 =>  30.0
  IXM SEC:  MXE4       46.63     -350.0 => 350.0


NOTE: All Sonde Error Corrections have been normalized to 25 DegC.


               Shop Electronic Calibration Summary

Electronic Calibration:  Calibration of System Electronics
                         using the internal reference

Induction Electronics:

      Offset  Valid Range    Gain  Valid Range     Phase   Valid Range
      (MM/M )   (MM/M )      (--)     (---)        (DEG.)    (DEG.)

10 KHz:
  IRD   20.1 -375. => 375.    .936   .75 => 1.25
  IXD   47.4 -375. => 375.    .942   .75 => 1.25   10.99  -5.00 => 20.00
  IRM   64.2 -900. => 900.    .954   .75 => 1.25
  IXM    1.5 -900. => 900.    .917   .75 => 1.25    8.98  -5.00 => 20.00

20 KHz:
  IRD    8.0 -150. => 150.    .983   .75 => 1.25
  IXD   19.6 -150. => 150.    .989   .75 => 1.25    9.11  -5.00 => 20.00
  IRM   26.2 -350. => 350.    .997   .75 => 1.25
  IXM     .7 -350. => 350.    .958   .75 => 1.25    8.51  -5.00 => 20.00

40 KHz:
  IRD    5.2 -100. => 100.    .979   .75 => 1.25
  IXD   13.1 -100. => 100.    .984   .75 => 1.25   24.78 -10.00 => 35.00
  IRM   17.0 -200. => 200.   1.003   .75 => 1.25
  IXM     .5 -200. => 200.    .964   .75 => 1.25   25.13 -10.00 => 35.00

SFL Electronics:

       Offset  Valid Range    Units      Gain   Valid Range

  SFV     .5  -16.0 => 16.0    MV         .988   .75 => 1.25
  SFC    -.0     -.7 =>   .7   MA         .987   .75 => 1.25


DITE               Electronics Calibration Summary

Sonde SN#: 151
Cartridge SN#: 159
Induction Freq: 20  KHz

Induction Electronics:

      Offset  Valid Range    Gain  Valid Range     Phase   Valid Range
      (MM/M )   (MM/M )      (--)     (---)        (DEG.)    (DEG.)

  IRD    8.0 -117. => 133.    .982   .84 => 1.18
  IXD   19.6 -105. => 145.    .988   .84 => 1.19    9.13  -5.89 => 24.11
  IRM   26.2 -199. => 251.    .995   .85 => 1.20
  IXM     .7 -224. => 226.    .956   .81 => 1.15    8.57  -6.49 => 23.51

SFL Electronics:

       Offset  Valid Range    Units      Gain   Valid Range

  SFV     .5  -14.5 => 15.5    MV         .99    .84 => 1.19
  SFC    -.0     -.6 =>   .6   MA         .99    .84 => 1.18
```

```
   CP 44.2           FILE    0      20-OCT-1997 09:45


                SHOP Summary


  Performed:    12-AUG-1997 11:13
  Program File: CCSHOP (Version    44.2    95/07/25  95/07/25)


CNTH            Detector Calibration Summary

      CNC #                  : 4431
      Neutron Source #       : 2576
      Thermal Housing #      : 4431
      Alpha detectors        : Yes

          Input      Plus       Shop    Gain      Shop
                  Reference     Tank              Bkg
                    Counts     Counts            Counts

          CNTC    6031.00    5998.75   1.005     24.754
          CFTC    2793.00    2640.31   1.058     30.245

          RATIO      2.159      2.272

          Shop Counts temperature and housing size corrected

Shop Tank Calibration done: 12-AUG-1997 11:13

   CP 44.2           FILE    0      12-AUG-1997 11:13


                SHOP Summary


  Performed:    12-AUG-1997 14:06
  Program File: CCSHOP (Version    44.2    95/07/25  95/07/25)


LDTD            Detector Calibration Summary

        Density Resistivity Sonde Number     :  4768
        Nuclear Service Cartridge Number     :  2979
        Powered Detector Housing Number      :  1989
        Powered Gamma-Gamma Detector Number  :  1989
        LDT Logging Source Number            :  1925
        LDT Calibration Mode                 :  WATE

                   Master Calibrated
                 Bkgd    Al+Fe     Al   Units
            LL    19.9    91.5   100.0   CPS
            LU    76.0   137.2   150.3   CPS
            LS    58.0   160.1   175.1   CPS
          LITH     5.6    42.3    66.5   CPS
           SS1    18.2   174.5   191.0   CPS
           SS2    12.4   250.6   271.1   CPS

          HV Settings            Detector Resolutions
        HV LS:  1230.1 V              LS:  8.7 %
        HV SS:  1201.1 V              SS:  8.7 %

                    Spectrum Quality Ratios
          Computed Value          Nominal Value    Tolerance
   QRLS        .666                   0.65          +/- 0.05
   QRSS        .704                   0.72          +/- 0.10
   QRLI        .380                   0.39          +/- 0.06
   QLIR       1.436                   1.39          +/- 0.06
   QR         1.000                   1.00          +/- 0.02

Shop Block Calibration done: 12-AUG-1997 13:57

   CP 44.2           FILE    0      12-AUG-1997 14:06
```

COMPANY	NORTHWEST NATURAL GAS			**SCHL.**	**FR**	1810.0 F
				SCHL.	**TD**	1820.0 F
WELL	IW 22H-22-65			**DRLR.**	**TD**	1825.0 F
				Elev:	**KB**	596.6 F
FIELD	MIST GAS STORAGE				**DF**	
COUNTY:	COLUMBIA	**STATE:**	OREGON		**GL**	580.6 F

Schlumberger

DUAL INDUCTION
SP / GAMMA RAY