DOGAMI #508

Schlumberger

DUAL INDUCTION / SP SONIC / GAMMA RAY 2" LOG

COUNTY	COLUMBIA
FIELD	MIST GAS STORAGE
LOCATION	N 03-03-15 E 2296.41 & S 86-56-45
WELL	IW 22DH-22-65
COMPANY	NORTHWEST NATURAL GAS CO.

COMPANY NORTHWEST NATURAL GAS CO.

WELL IW 22DH-22-65

FIELD MIST GAS STORAGE

COUNTY: COLUMBIA **STATE:** OREGON

LOCATION
N 03-03-15 E 2286.41' & S 86-56-45
1915.16' FROM THE SW CORNER OF SEC. 22

API SERIAL NO.	SECT.	TWP.	RANGE
36-009-00328	22	6N	5W

Other Services:
INDUCTION
SONIC
FMS
DENSITY
NEUTRON
GAMMA RAY

Permanent Datum	GROUND LEVEL	**Elev.**	579.7 F	**Elev.:** K.B.595.7 F
Log Measured From	KELLY BUSHING	16.0 F	**above Perm. Datum**	D.F.
Drilling Measured From	KELLY BUSHING			G.L.579.7 F

Date	16-JAN-1998		23-JAN-1998			
Run No.	ONE		TWO			
Depth Driller	1995.0 F		2746.0 F			
Depth Logger (Schl.)	1990.0 F		2735.0 F			
Btm. Log Interval	1980.0 F		2725.0 F			
Top Log Interval	0.0 F		1990.0 F			
Casing-Driller	13 3/8" @ 426.0 F		8 5/8" @ 1992.0 F		@	
Casing-Logger	422.0 F		1992.0 F			
Bit Size	@		@		@	
Type Fluid in Hole	LSND		FLO-PRO			
Dens. / Visc.	9.80 LB/G	47.0 S	8.50 LB/G			
pH / Fld. Loss	8.5		10.0			
Source of Sample	FLOWLINE		FLOWLINE			
Rm @ Meas. Temp.	2.620 OHMM @ 64.0 DEGF		.245 OHMM @ 69.0 DEGF			
Rmf @ Meas. Temp.	1.560 OHMM @ 62.0 DEGF		.122 OHMM @ 67.0 DEGF			
Rmc @ Meas. Temp.	1.320 OHMM @ 62.0 DEGF		.134 OHMM @ 67.0 DEGF			
Source: Rmf / Rmc	CELL	CELL	CELL	CELL		
Rm @ BHT	1.806 OHMM @ 96.0 DEGF		.176 OHMM @ 99.0 DEGF			
TIME Circulation Ended	2:00 16-JAN-98		18:30 22-JAN-98			
TIME Logger on Bottom	SEE LOG					
Max. Rec. Temp.	96.0 DEGF		99.0 DEGF			
Equip. / Location	8303	BAKERSFIELD	8303	BAKERSFIELD		
Recorded By	GREG PERRY		GREG PERRY			
Witnessed By	MR. MEYER / MR. THOMAS		MR. ROTH			

SCANNED

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 willful 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			TWO		
Service Order No.						
Drilling Fluid Level	0.0 F					
Salinity						
Rmf @ BHT	1.045 OHMM	@	96.0 DEGF	.085 OHMM	@	99.0 DEGF
Rmc @ BHT	.884 OHMM	@	96.0 DEGF	.094 OHMM	@	99.0 DEGF
Logging Speed	1800.0 F/HR					
EQUIPMENT DATA						
Tool Number 1	DIS 151					
Tool Number 2	DIC 159					
Tool Number 3	SLSWA					
Tool Number 4	SLC 432					
Tool Number 5	SGC 483					
Tool Number 6	TCCB 1289					
Tool Number 7	.					
Tool Number 8	AMS					
Tool Number 9	SHE					
Tool Number 10						
Tool Number 11						
Tool Number 12						

REMARKS:

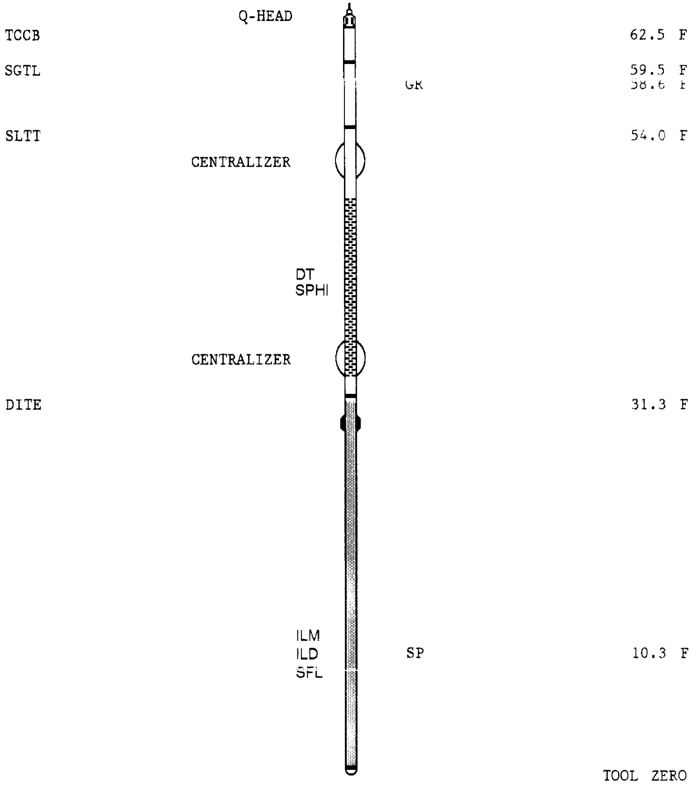
RAN FLEX JOINTS ON INDUCTION AND SONIC.
RAN 6 ARM FINS ON SONIC.
RAN FLEX JOINTS ABOVE FMS AND ABOVE AMS.

DID NOT TAG TD DUE TO PUSH DOWN TOOLS.

CREW: DAN LEE.

THANKS FOR CHOOSING SCHLUMBERGER!!!!!!

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
93 TO 76	1985.0 F

CHANGED PARAMETERS

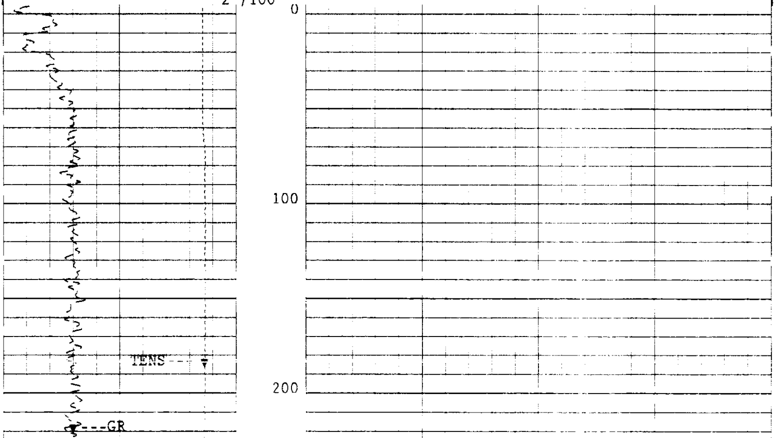
NAME	VALUE	UNIT	DEPTH (F)	NAME	VALUE	UNIT	DEPTH (F)
DO	0.0	F	1986.0				

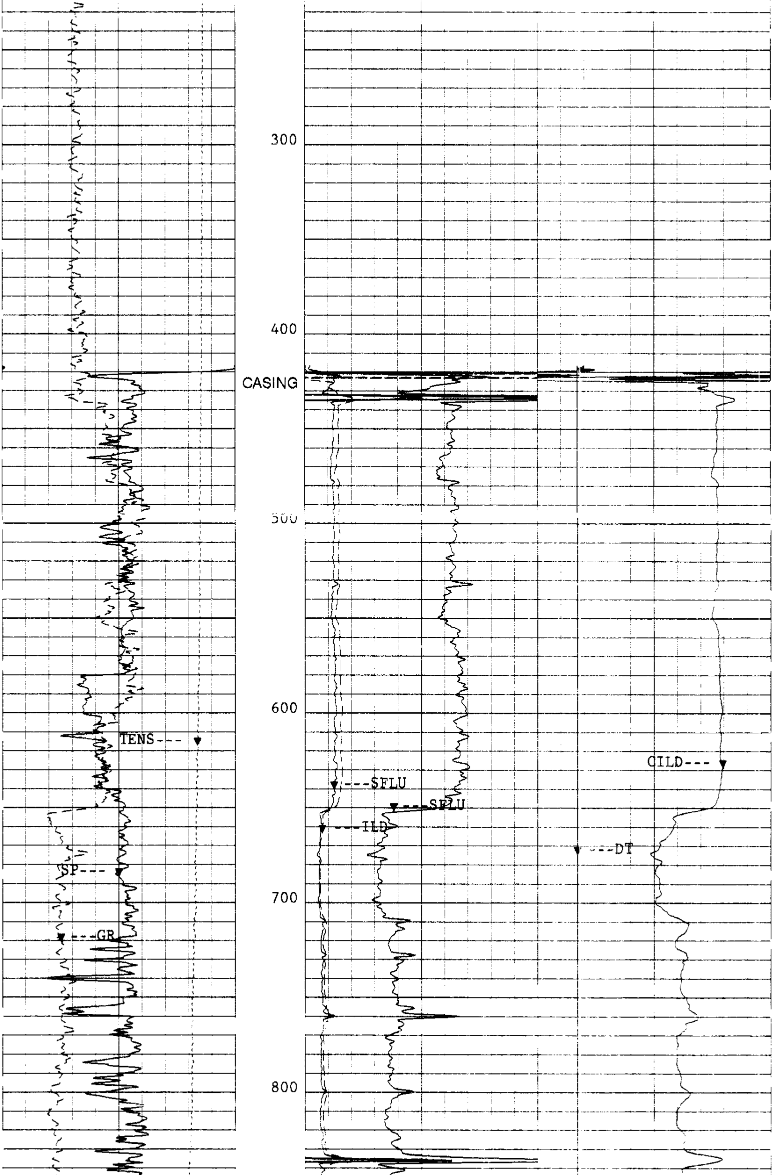
TENS(LBF)
10000. 0.0
GR(GAPI)
0.0 150.00

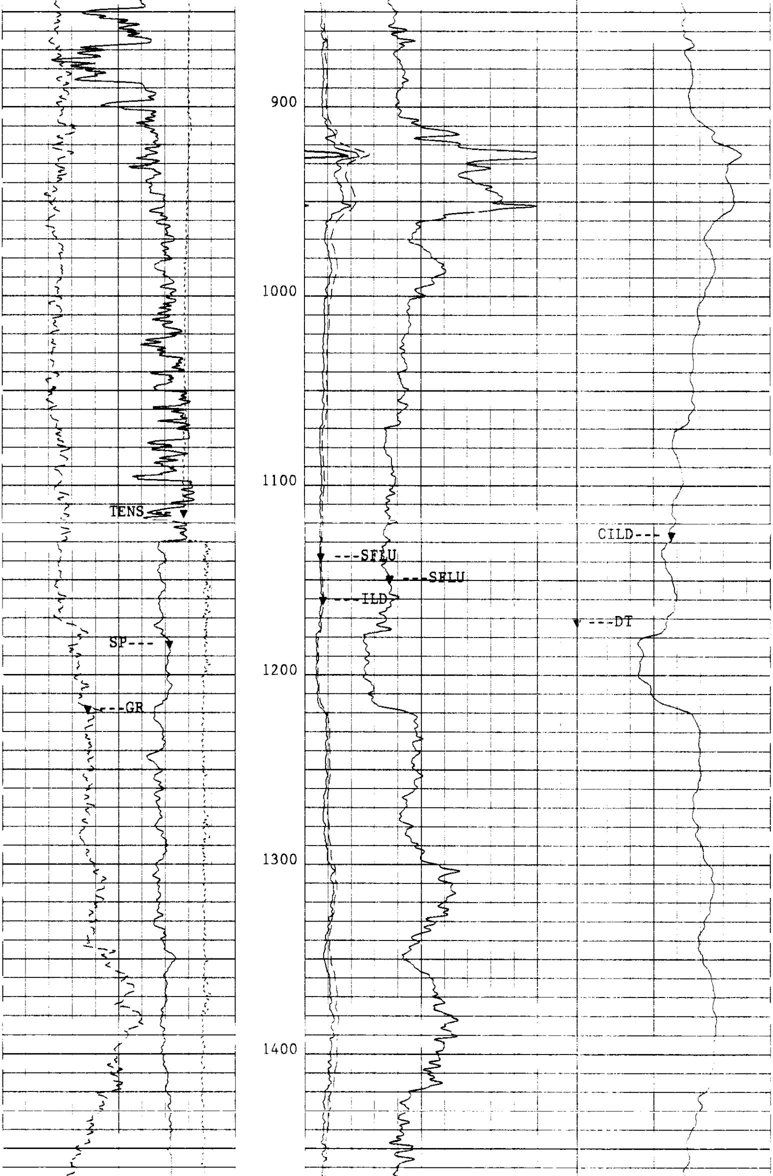
CP 44.2 FILE 95 23-JAN-1998 08:07

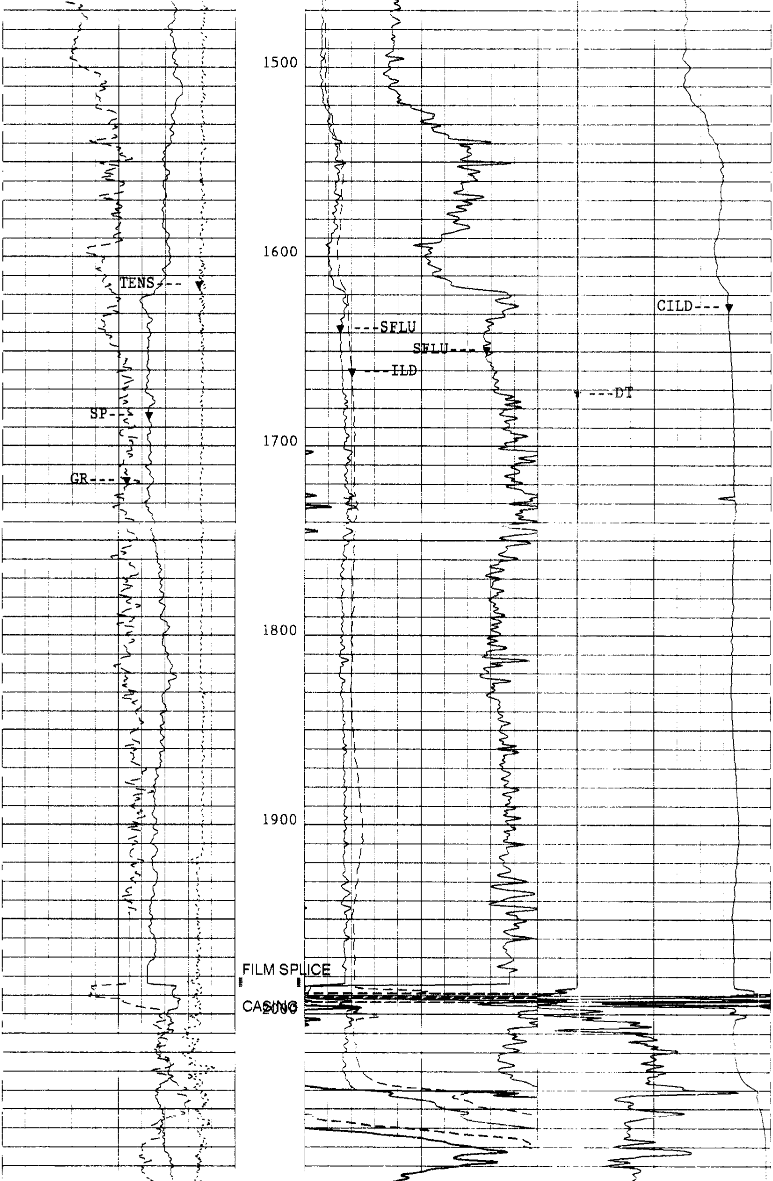
INPUT FILE(S) 76
CREATION DATE 16-JAN-1998

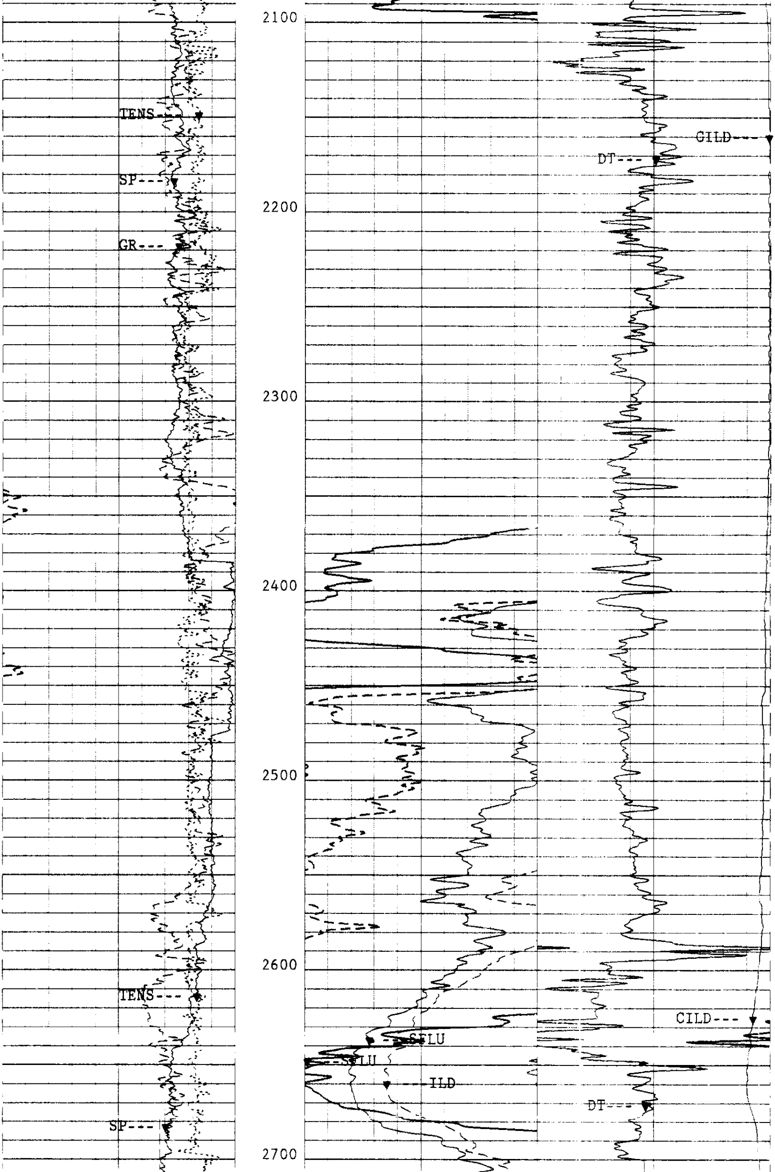
2"/100'

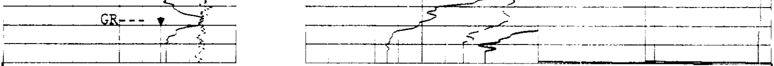












2"/100'

```
CP 44.2             FILE    95       23-JAN-1998 07:57

                    INPUT FILE(S)    CREATION DATE
                          93         23-JAN-1998 06:47
```

TENS(LBF)	10000.	0.0	SFLU(OHMM)	0.0	30.000			
SP(MV)	-50.00	50.000	SFLU(OHMM)	0.0	6.0000	CILD(MM/M)	1000.0	0.0
GR(GAPI)	0.0	150.00	ILD(OHMM)	0.0	30.000	DT(US/F)	175.00	75.000

SENSOR MEASURE POINT TO TOOL ZERO

```
DITE 10.3   FEET                    SGTL 62.6   FEET
AMS  71.8   FEET                    DTT   0.0   FEET
SLTT 41.6   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	4.00000	F
WMUD	8.50000	LB/G	TD	32768.0	F
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	85.0000	DEG	DSES	H48	
IPRO	STAN		IPHA	NORM	
DWCO	512		DSIN	5	US
DDEL	200	US	NCJT	GSRY	
GTSE	TEMP		SHT	45.0000	DEGF
BHT	85.0000	DEGF	DTCI	0.0	F
SPAE	DISA		BS	7.87500	IN
BHS	OPEN				

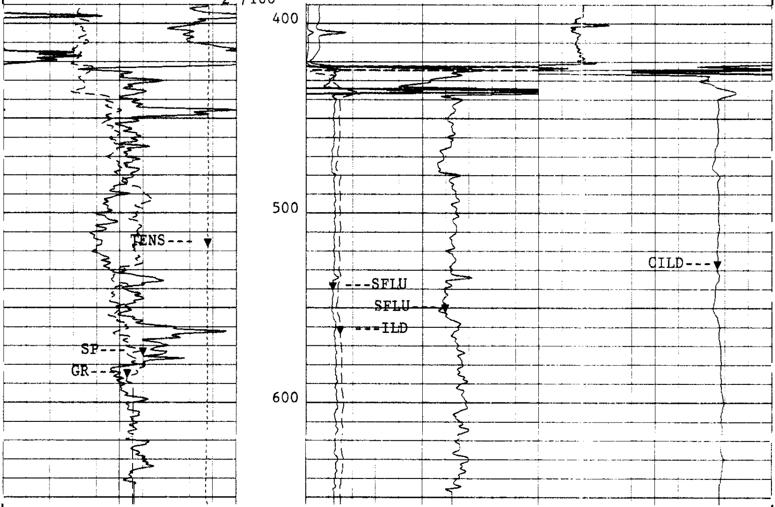
REPEAT SECTION

TENS(LBF)	10000.	0.0	SFLU(OHMM)	0.0	30.000			
SP(MV)	-50.00	50.000	SFLU(OHMM)	0.0	6.0000			
GR(GAPI)	0.0	150.00	ILD(OHMM)	0.0	30.000	CILD(MM/M)	1000.0	0.0

CP 44.2 FILE 1 16-JAN-1998 11:59

INPUT FILE(S) CREATION DATE
1 16-JAN-1998 05:19

2"/100'



2"/100'

CP 44.2 FILE 1 16-JAN-1998 11:58

INPUT FILE(S) CREATION DATE
1 16-JAN-1998 05:19

TENS(LBF)		SFLU(OHMM)			
10000.	0.0	0.0	30.000		
SP(MV)		SFLU(OHMM)			
-50.00	50.000	0.0	6.0000		
GR(GAPI)		ILD(OHMM)		CILD(MM/M)	
0.0	150.00	0.0	30.000	1000.0	0.0

SENSOR MEASURE POINT TO TOOL ZERO

DITE 10.3 FEET
AMS 47.2 FEET

SGTL 37.9 FEET
DTT 0.0 FEET

PARAMETERS

NAME	VALUE	UNIT	NAME	VALUE	UNIT

```
PP   NORM                                DO   2.00000       F
WMUD 9.80000      LB/G                   TD   32768.0       F
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 85.0000      DEG                    DSES H48
IPRO STAN                                IPHA NORM
NCJT GSRY                                GTSE TEMP
SHT  45.0000      DEGF                   BHT  85.0000       DEGF
DTCI 0.0          F                      SPAE DISA
BS   12.2500      IN                     BHS  OPEN
```

CALIBRATIONS

```
                BEFORE SURVEY CALIBRATION Summary


  Performed:     16-JAN-1998 05:19
  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    7.8 -117. => 133.    .992  .84 => 1.18
  IXD   21.2 -105. => 145.   1.001  .84 => 1.19     7.96  -5.89 => 24.11
  IRM   25.6 -199. => 251.   1.000  .85 => 1.20
  IXM    -.5 -224. => 226.    .960  .81 => 1.15     7.53  -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: 16-JAN-1998 05:18

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

   CP 44.2           FILE    0       16-JAN-1998 05:18
```

```
                 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
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```
       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)


  LDID             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 CO.

WELL IW 22DH-22-65

FIELD MIST GAS STORAGE

COUNTY: COLUMBIA **STATE:** OREGON

SCHL.	**FR**	2725.0 F
SCHL.	**TD**	2735.0 F
DRLR.	**TD**	2746.0 F
Elev:	**KB**	595.7 F
	DF	
	GL	579.7 F

Schlumberger

DUAL INDUCTION / SP SONIC / GAMMA RAY 2" LOG