C. Files

*DIGITAL VELOCITY CONVERSION*

# CENTURY
## GEOPHYSICAL CORPORATION
TULSA, OKLAHOMA, U.S.A.

**GEOPHYSICAL LOG**
SONIC LOG
VS-10084

**FILE NO.**

**COMPANY** HUMBLE OIL & REFINING COMPANY

**WELL** NO. 1 OCS-P-0205

**FIELD** SANTA CRUZ TREND

**LOCATION** X - 1,046,798
Y - 728,472 ZONE 6

**County, Parish, or Province** (O.S.) SANTA BARBARA

**State, or Country** CALIFORNIA

**DETAILED LOCATION OF WELL:**

**D.V.C. DATA**

Date: 12-28-70
First Reading 12827
Last Reading 1247
Feet Measured 11580
Total Depth 12829
Dicon Unit Tulsa
Operator Jernegan

**ELEVATIONS**

K.B. +39'
D.F.
R.T.
G.L. (OF) -719'
Permanent Datum MLLW

COMPANY HUMBLE OIL & REFINING COMPANY FILE NO.
WELL NO. 1 OCS-P-0205
FIELD, or LOCATION SANTA CRUZ TREND
County, Parish, or Province (O.S.) SANTA BARBARA
State, or Country CALIFORNIA

| | | | | |
|---|---|---|---|---|
| **Run No.** | ONE (BHC) | TWO (BHC) | THREE (BHC) | FOUR (BHC) |
| **Date** | 9-13-70 | 9-16-70 | 9-29-70 | 11-4-70 |
| **Depth-Driller** | 2332 | 3207 | 8999 | 12801 |
| **Depth-Logger** | 2342 | 3222 | 9019 | 12829 |
| **First Reading** | 2333 | 3221 | 9018 | 12828 |
| **Last Reading** | 1248 | 2333 | -- | 8990 |
| **Casing-Driller** | 1243 | 2256 | 3187 | 8977 |
| **Casing-Logger** | 1248 | 2286 | -- | 8990 |
| **Bit Size** | 12 1/4" | 12 1/4" | 8 3/4" | 6" |
| **Casing Size** | 16" | 11 3/4" | 9 5/8" | 7" |
| **Mud Data** | FGM | FGM | FGM | FGM |
| **Density & Viscosity** | 8.9 47 | 10.7 \| 47 | 10.8 \| 44 | 9.5 \| 56 |
| **pH & Fluid Loss** | 10.5 12.0 | 9.4 \| 10.5 cc | 10.0 \| 7.4 cc | 11.0 \| 9.4 cc |
| **Source of Sample** | Circ. | Circ. | Circ. | Circ. |
| **Rm @ Meas. Temp.** | 4.33 68 | 2.0 @ 71 °F | 1.90 @ 72 °F | 2.2 @ 68 °F |
| **Rmf @ Meas. Temp.** | 4.10 68 | 1.36 @ 65 °F | 1.59 @ 76 °F | 2.18 @ 61 °F |
| **Rmc @ Meas. Temp.** | 4.48 68 | 2.5 @ 65 °F | 1.65 @ 74 °F | 1.99 @ 67 °F |
| **Rm @ BHT** | 3.25 93 | 1.39 @ 102 °F | .84 @ 160 °F | .675 @ 224 °F |
| **Equip. No. & Loc.** | C266 VTA. | C266 \| VTA. | C266 \| VTA. | C266 \| VTA. |
| **Recorded By** | Montgomery | Masterson | Roth | Masterson |
| **Witnessed By** | Blankenship | Blankenship | Switzer | Blankenship |

**GEOPHYSICAL DATA**

Seismic Datum: Sea Level
Correction Velocity: 4885'/"
Difference - Seismic Datum & Log Datum: 39'
Direction Survey Shot: Downward & Upward
Well Geophone: Gulf Model "101"
Amplifiers: 8 CGC
Model: 510
Well Phone Amplifier: Traces 1-3, NF-100
Traces 5-7, NF-82
Reflection Filter: NF-NF
Time: 4 1/4 Hours
Unit: T-35
Operator: Johnson

**REMARKS**

Depths on log referred to K.B. +39'. Times on log referred to a seismic datum of Sea Level. The integration is tied to the top of the log. Since there was a variance from +.0095 seconds to -.0079 seconds between the unadjusted integration and seismic data, an adjusted integration was necessary. The unadjusted integration is shown down the center of the log, and the adjusted integration down the right side.

"A" side vertical times (except for the value at total depth) were not used in final results. The breaks were generally of good quality; however, times led "B" values excessively.

The vertical time at 9000' was not used in final results; since the depth below log datum appears to be approximately 100 feet shallow.

The correction velocity of 4885'/" was determined using the measured salinity (22,000 PPM) of the sea water at a temperature of 58° Fahrenheit.

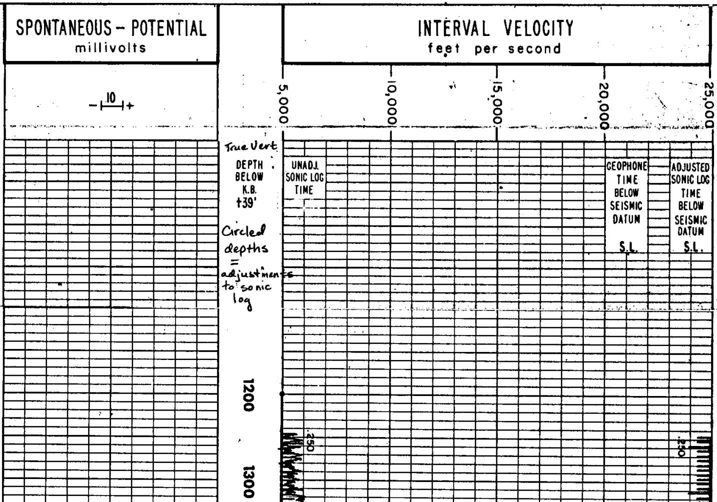
Reference hydrophones were placed 50' below water level on each side of the drilling barge (197' east and 160' west). Distances from each reference hydrophone to the shot location was determined by multiplying the arrival times by the velocity of 4885'/". The intersection of arcs drawn from each hydrophone determined the azimuth and distance to each shot location.

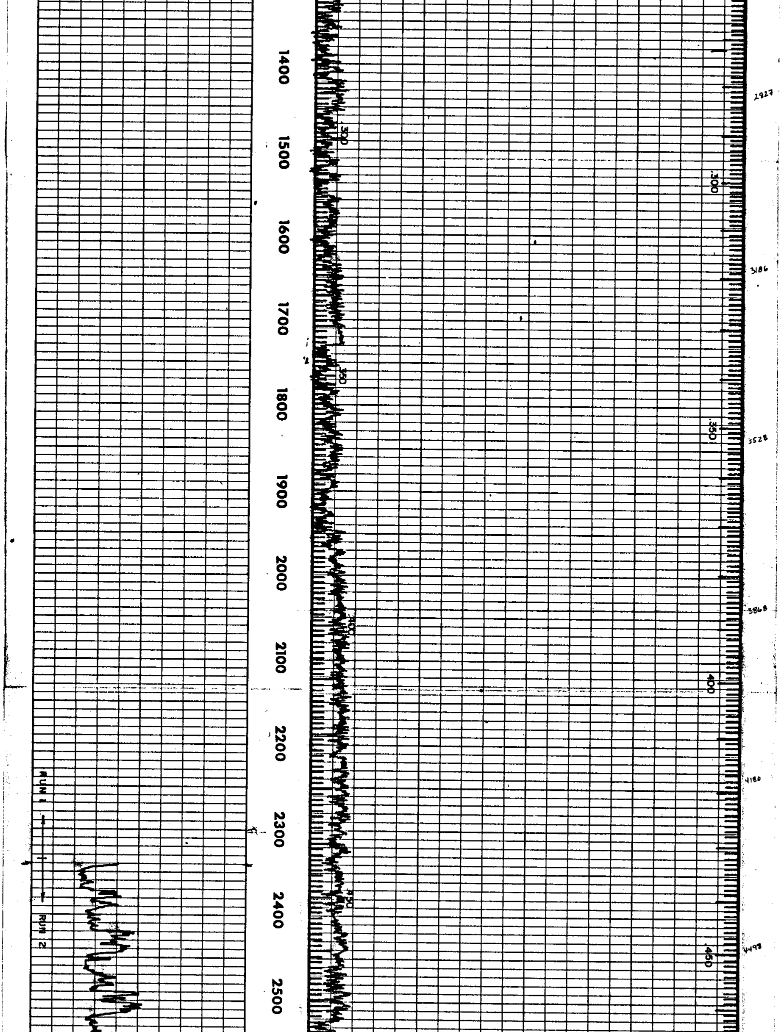
The quality of this survey is considered reliable.

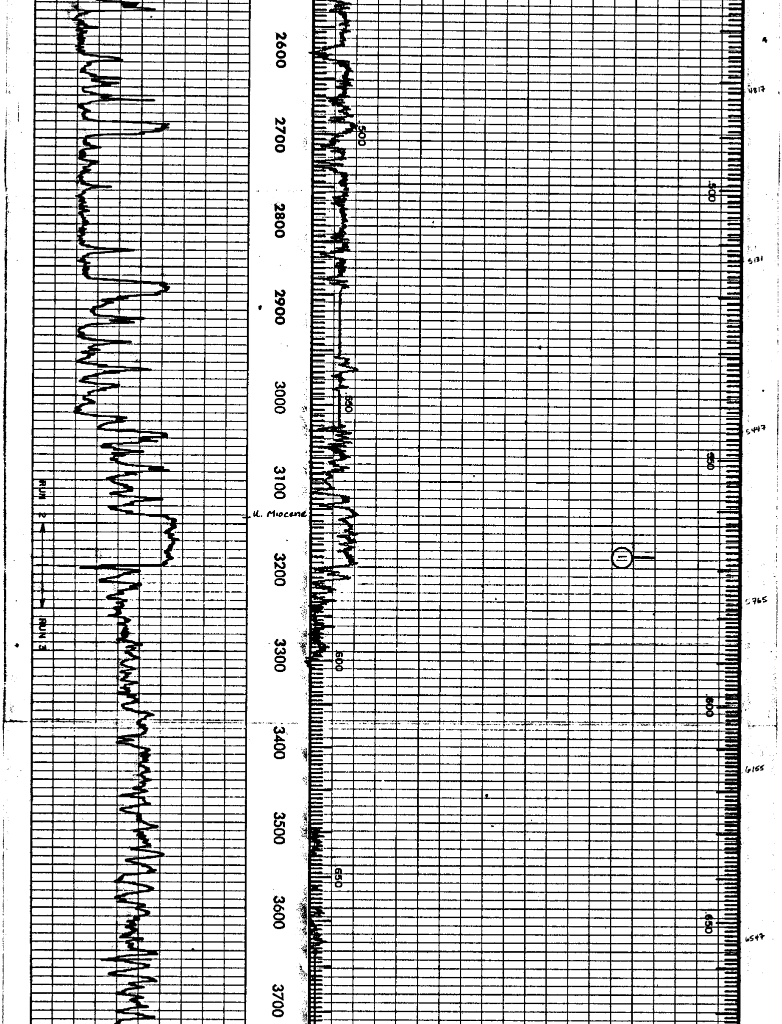
Adjustments to the Sonic Log, based on seismic data, are as follows:

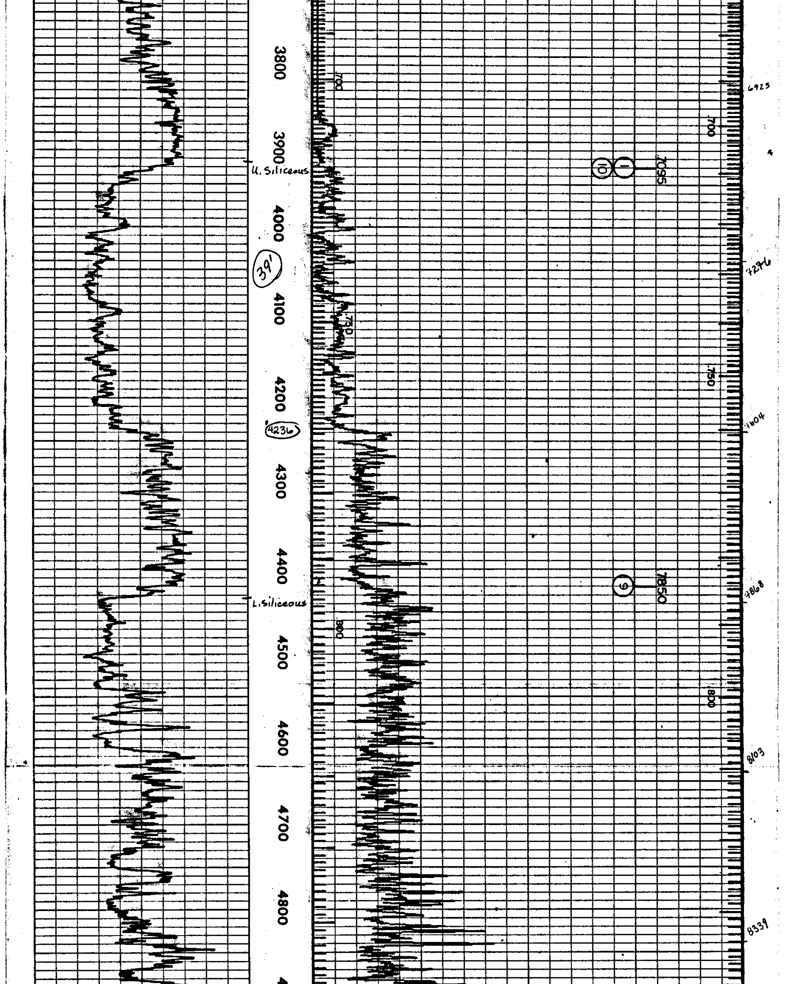
$$\Delta T_{srs} = (\Delta T_{log})\ (\text{Alpha}) + \text{Beta}$$

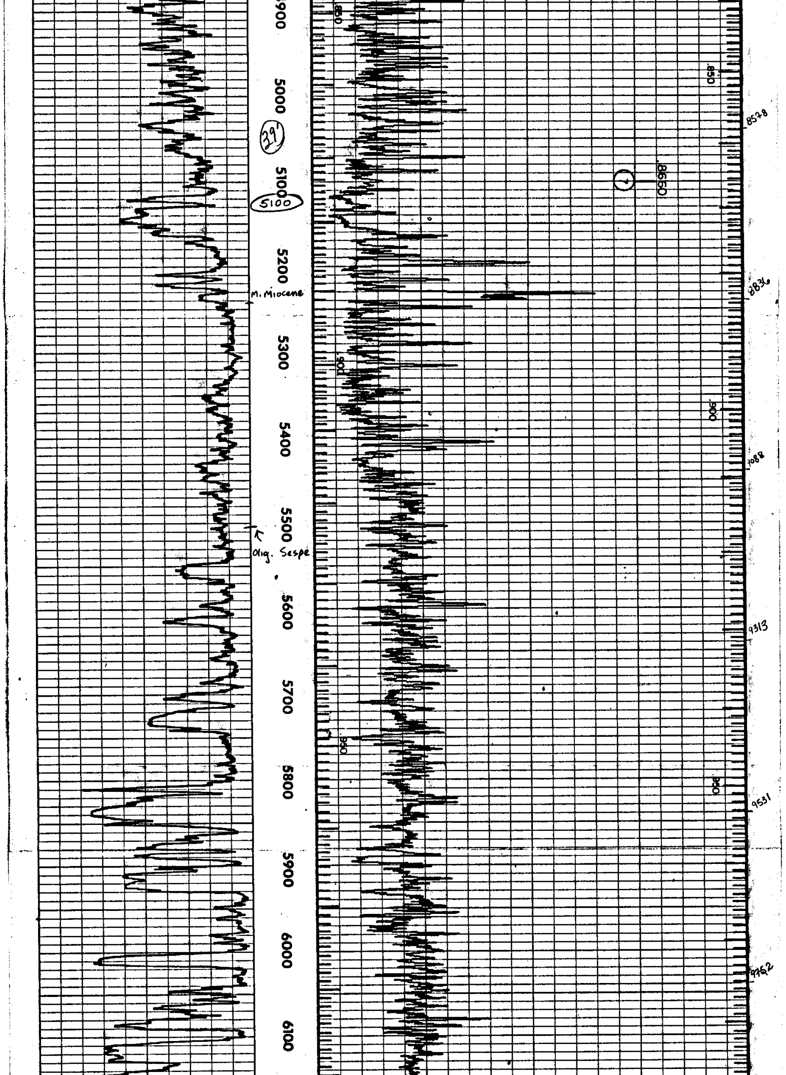
4236' - 5100' 2.50 Microseconds/ft. Beta
5100' - 9000' 3.92 Microseconds/ft. Beta

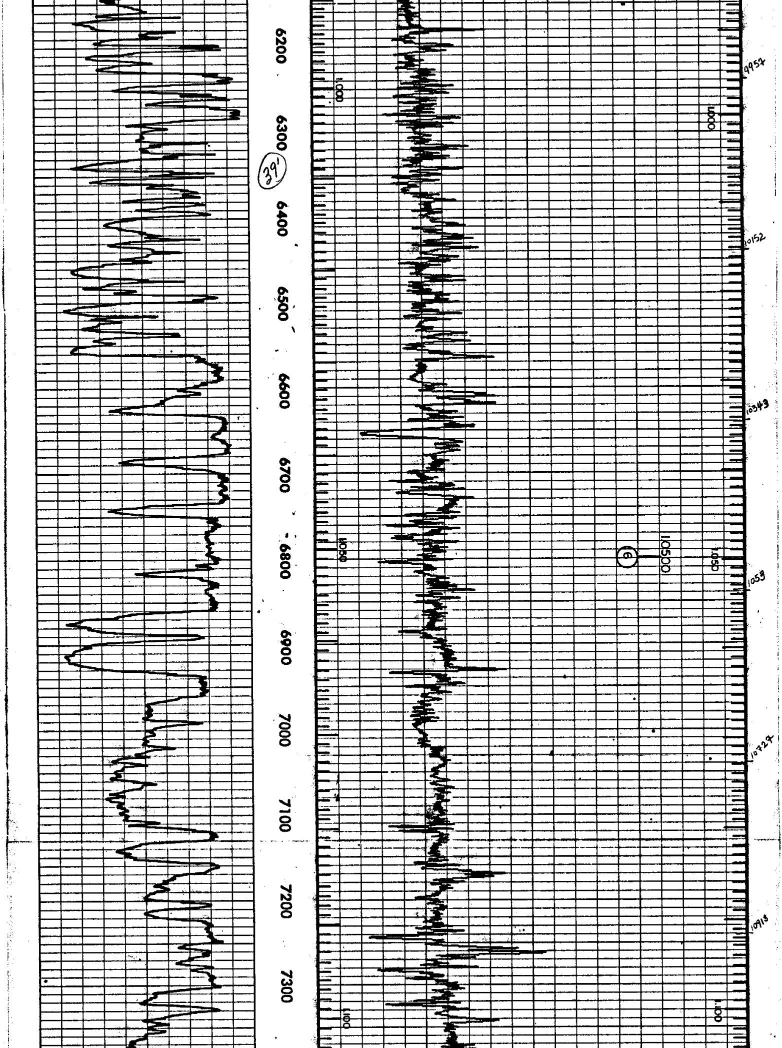


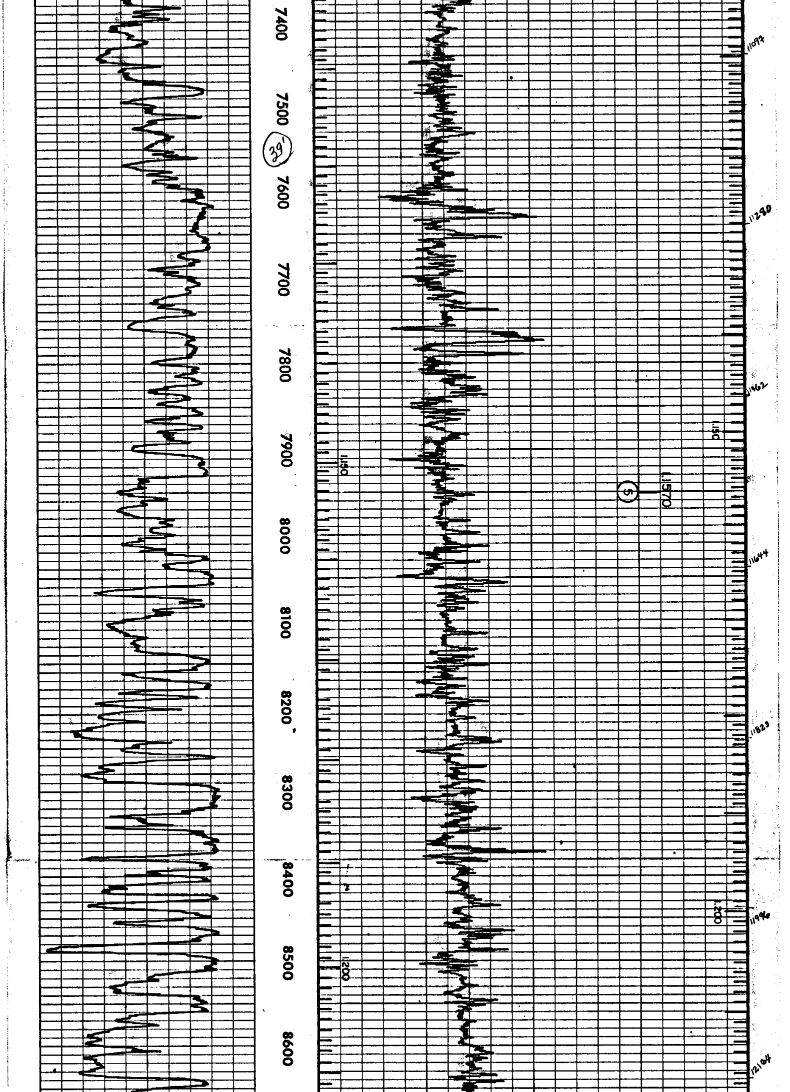


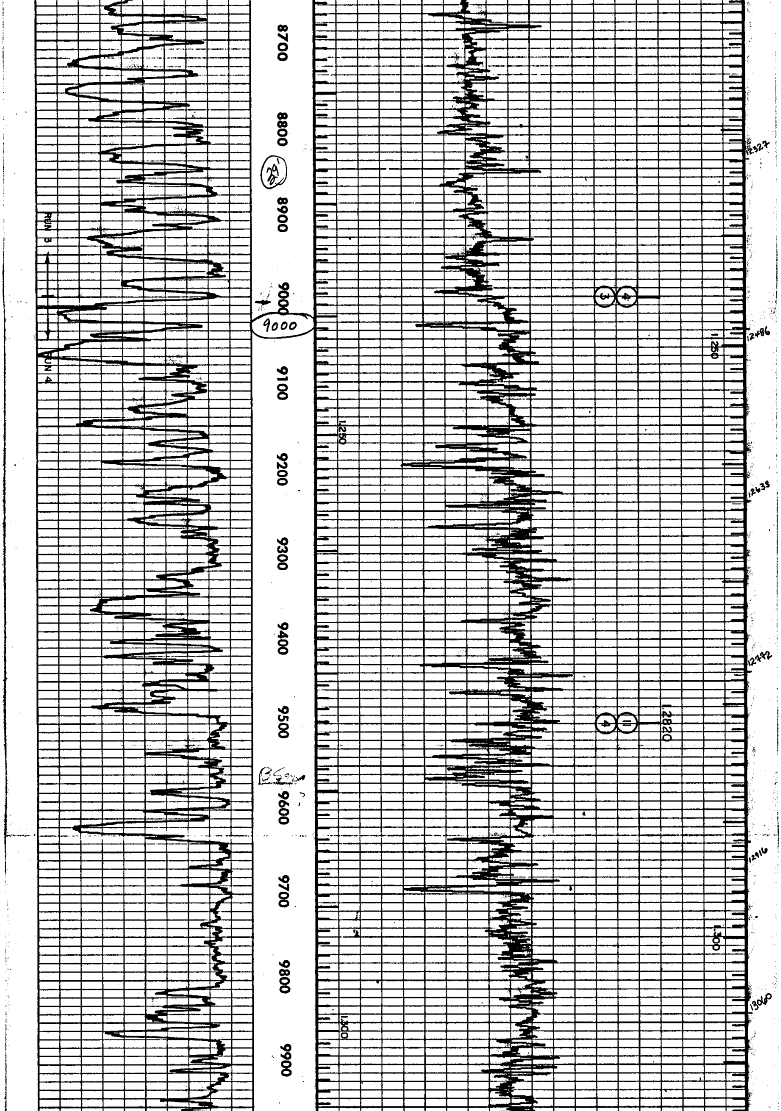


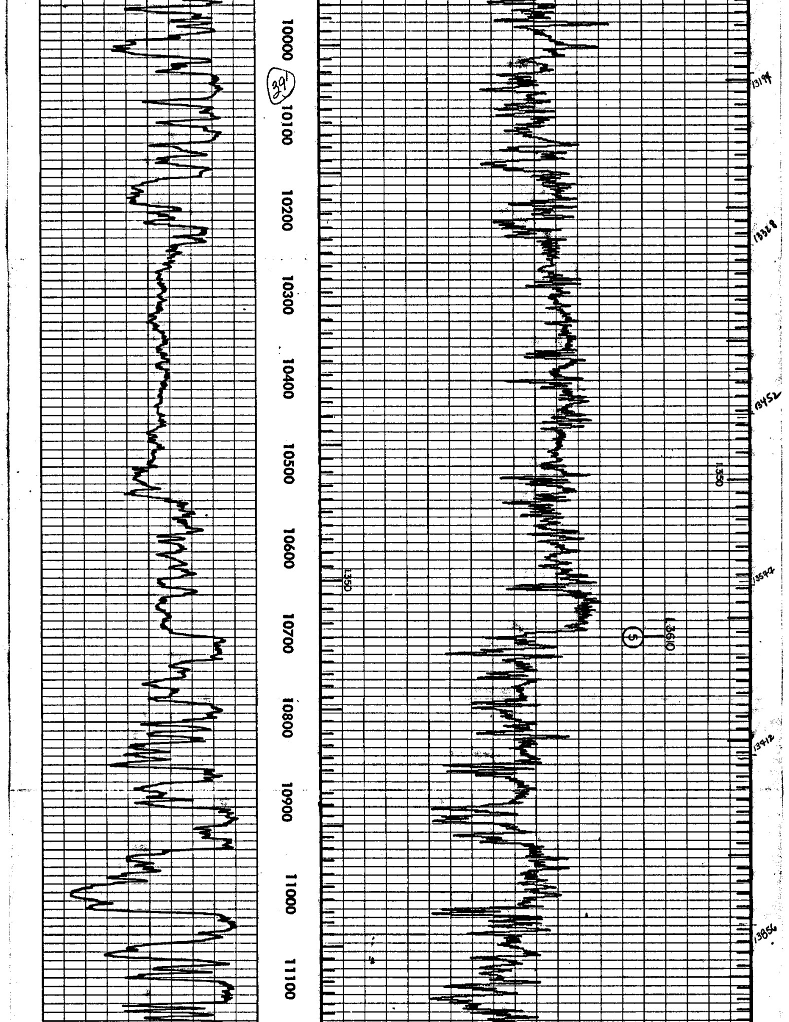


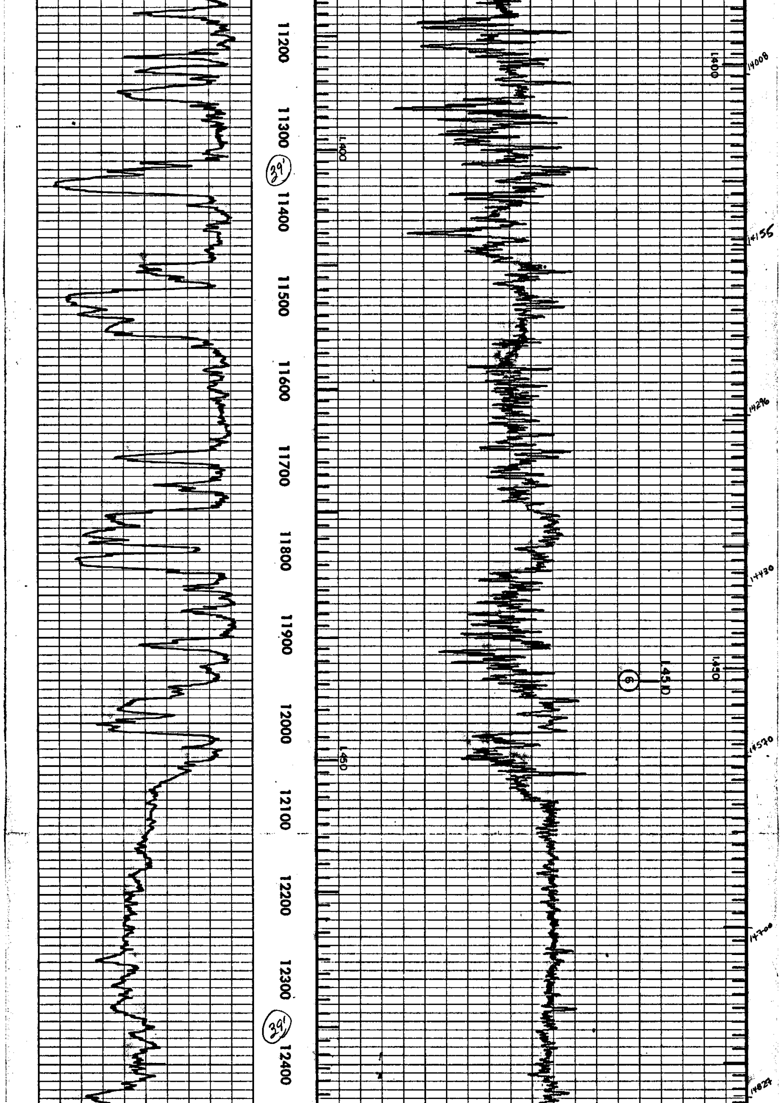


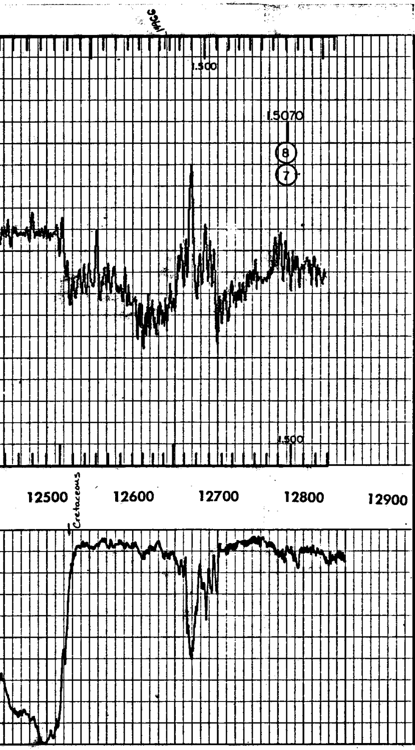


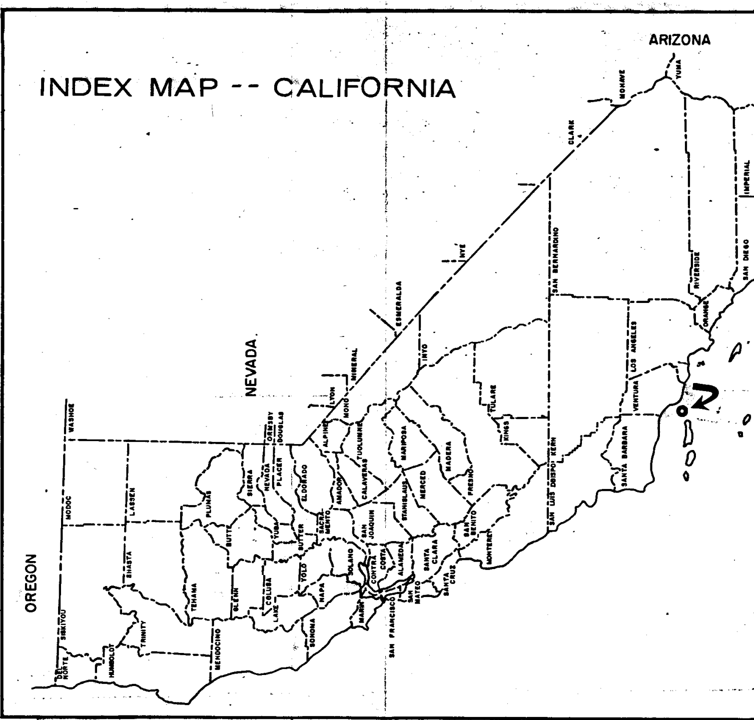


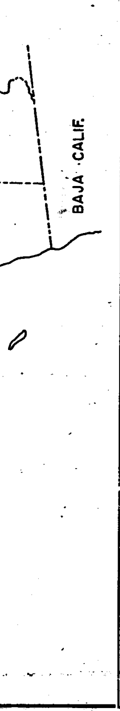






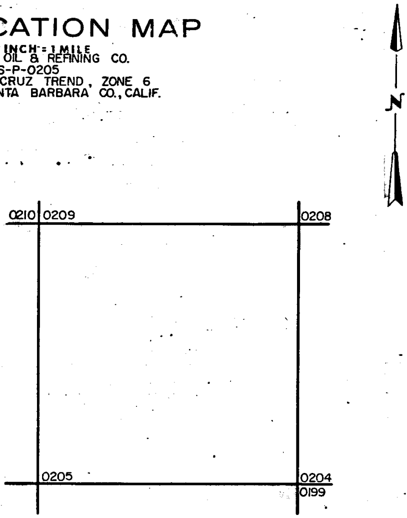



INDEX MAP -- CALIFORNIA



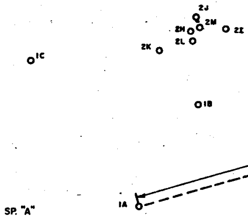
# LOCATION MAP

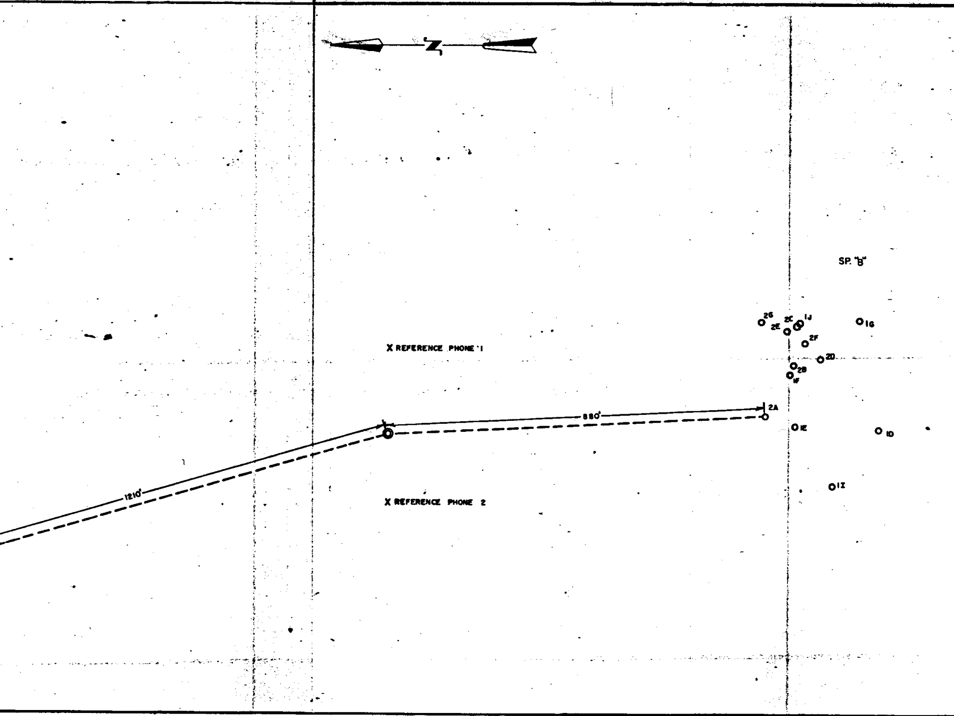
SCALE: 1 INCH = 1 MILE
HUMBLE OIL & REFINING CO.
NO. 1 OCS-P-0205
SANTA CRUZ TREND, ZONE 6
O.S. SANTA BARBARA CO., CALIF.



# SHOOTING PLAN

SCALE: 1 INCH = 200 FEET
◉ WELL SURVEYED
○ SHOT POINT
x GEOPHONE





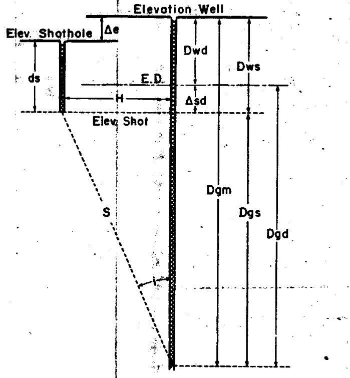
SEISMIC
REFERENCE
SERVICE

# SOURCE DATA FOR VELOCITY SURVEY

| DEPTH BELOW LOG DATUM | SHOT POINT NUMBER | HORIZONTAL DISTANCE FROM WELL | SHOT POINT ELEVATION | tR | DEPTH OF SHOT | RECORD TIME | SHOT POINT NUMBER | HORIZONTAL DISTANCE FROM WELL | SHOT POINT ELEVATION | tR | DEPTH OF SHOT | RECORD TIME |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 3,187 | A1 A | 1210 | 0 | 0.251 | 50 | 0.579 G | | | | | | |
| 3,930 | | | | | | | B1 J | 990 | 0 | 0.204 | 50 | 0.717 F |
| 3,930 | | | | | | | B2 A | 880 | 0 | 0.184 | 50 | 0.722 F |
| 4,420 | | | | | | | B1 I | 1045 | 0 | 0.218 | 50 | 0.797 G |
| 5,100 | | | | | | | B1 G | 1135 | 0 | 0.234 | 50 | 0.877 F |
| 6,800 | | | | | | | B1 F | 950 | 0 | 0.197 | 50 | 1.050 F |
| 7,950 | | | | | | | B1 E | 950 | 0 | 0.198 | 50 | 1.155 P |
| 9,000 | A1 C | 1415 | 0 | 0.292 | 50 | 1.216 F | B1 D | 1145 | 0 | 0.238 | 50 | 1.239 P |
| 9,500 | A2 K | 1115 | 0 | 0.231 | 50 | 1.250 G | B2 D | 1025 | 0 | 0.213 | 50 | 1.279VP |
| 10,700 | | | | | | | B2 E | 960 | 0 | 0.199 | 50 | 1.356 Q |
| 11,950 | | | | | | | B2 F | 995 | 0 | 0.206 | 50 | 1.446 Q |
| 12,780 | A2 H | 1040 | 0 | 0.216 | 50 | 1.503 P | B2 G | 910 | 0 | 0.189 | 50 | 1.500VP |

Reference hydrophones were placed 50' below water level on each side of the drilling barge (197' east and 160' west). Distances from each reference hydrophone to the shot location was determined by multiplying the arrival times by the velocity of 4885 '/". The intersection of arcs drawn from each hydrophone determined the azimuth and distance to each shot location.

## CROSS - SECTION ILLUSTRATING METHOD OF COMPUTATION



Dgm = Geophone depth below well elevation
Dwd = Difference between well elevation and elevation datum = Ew — ED
Dgd = Geophone depth below elevation datum = Dgm — Dwd
ts = Uphole time in shothole
tR = Refraction time from reference geophone
ds = Depth of shot
H = Horizontal distance from well to shothole
Δsd = Difference between shot elevation and elevation datum = Es — ds — ED
Dgs = Geophone depth below shot elevation = Dgd + Δsd
cos i = $Dgs/\sqrt{H^2 + Dgs^2}$
T = Observed travel time from shot to well geophone
Gr = Quality grade of well geophone "break"
Tgs = Travel time for Dgs distance = T cos i
Δsd/ve = Time correction from shot to elevation datum
Tgd = Travel time for Dgd distance = Tgs — Δsd/ve
va = Average velocity to depth Dgd = Dgd/Tgd
ΔDgd = Interval distance = $Dgd_n - Dgd_m$
ΔTgd = Interval time for ΔDgd distance = $Tgd_n - Tgd_m$
vi = Interval velocity = ΔDgd/ΔTgd
S = Direct diagonal distance from shot to geophone = Dgs/cos i
ED = Elevation or reference datum
ve = Elevation correction velocity
Δe = Difference between well elevation and shothole elevation = Ew — Es

**SEISMIC REFERENCE SERVICE**

# RESULTS OF VELOCITY SURVEY
## COMPUTED BY IBM 1130

| | | | |
|---|---|---|---|
| COMPANY | HUMBLE OIL & REFINING COMPANY | WELL ELEV. | +39' K.B. |
| WELL NAME | NO. 1 OCS-P-0205 | ELEV. DATUM | SEA LEVEL |
| LOCATION | X 1046798 Y 728472 | ELEV. VEL. | Ve = 4885 ft./sec. |
| | ZONE 6, OS SANTA BARBARA COUNTY, CALIF | | Vo = ft./sec. |
| DATE | 9-29 & 11-4-70 R.S. NO. 44-11-1 | | |

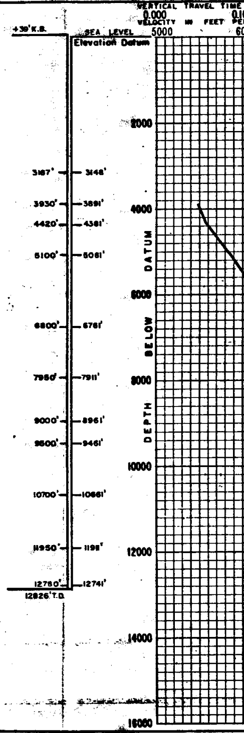
| FORMATION | SHOT SERIES | DEPTH BELOW | | VERTICAL TIME BELOW DATUM PLANE | QUAL. OF BREAK | AVERAGE BELOW DATUM PLANE | | INTERVAL | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | LOG DATUM | DATUM PLANE | | | TIME | VELOCITY | DEPTH | TIME | VELOCITY |
| | A | 3,187 | 3,148 | 0.550 | G | | | | | |
| | B | 3,930 | 3,891 | 0.705 | F | 0.7095 | 5,484 | | | |
| | B | 3,930 | 3,891 | 0.714 | F | | | | | |
| | | | | | | | | 490 | 0.0755 | 6,490 |
| | B | 4,420 | 4,381 | 0.785 | G | 0.7850 | 5,581 | | | |
| | | | | | | | | 680 | 0.0810 | 8,395 |
| | B | 5,100 | 5,061 | 0.866 | F | 0.8660 | 5,844 | | | |
| | | | | | | | | 1700 | 0.1840 | 9,239 |
| | B | 6,800 | 6,761 | 1.050 | F | 1.0500 | 6,439 | | | |
| | | | | | | | | 1150 | 0.1070 | 10,747 |
| | B | 7,950 | 7,911 | 1.157 | P | 1.1570 | 6,838 | | | |
| | A | 9,000 | 8,961 | 1.211 | F | | | 1550 | 0.1250 | 12,400 |
| | * B | 9,000 | 8,961 | 1.239 | P | | | | | |
| | A | 9,500 | 9,461 | 1.252 | G | | | | | |
| | B | 9,500 | 9,461 | 1.282 | VP | 1.2820 | 7,380 | | | |
| | | | | | | | | 1200 | 0.0790 | 15,189 |
| | B | 10,700 | 10,661 | 1.361 | Q | 1.3610 | 7,833 | | | |
| | | | | | | | | 1250 | 0.0900 | 13,888 |
| | B | 11,950 | 11,911 | 1.451 | Q | 1.4510 | 8,209 | | | |
| | | | | | | | | 830 | 0.0560 | 14,821 |
| | A | 12,780 | 12,741 | 1.508 | P | 1.5070 | 8,455 | | | |
| | B | 12,780 | 12,741 | 1.506 | VP | | | | | |

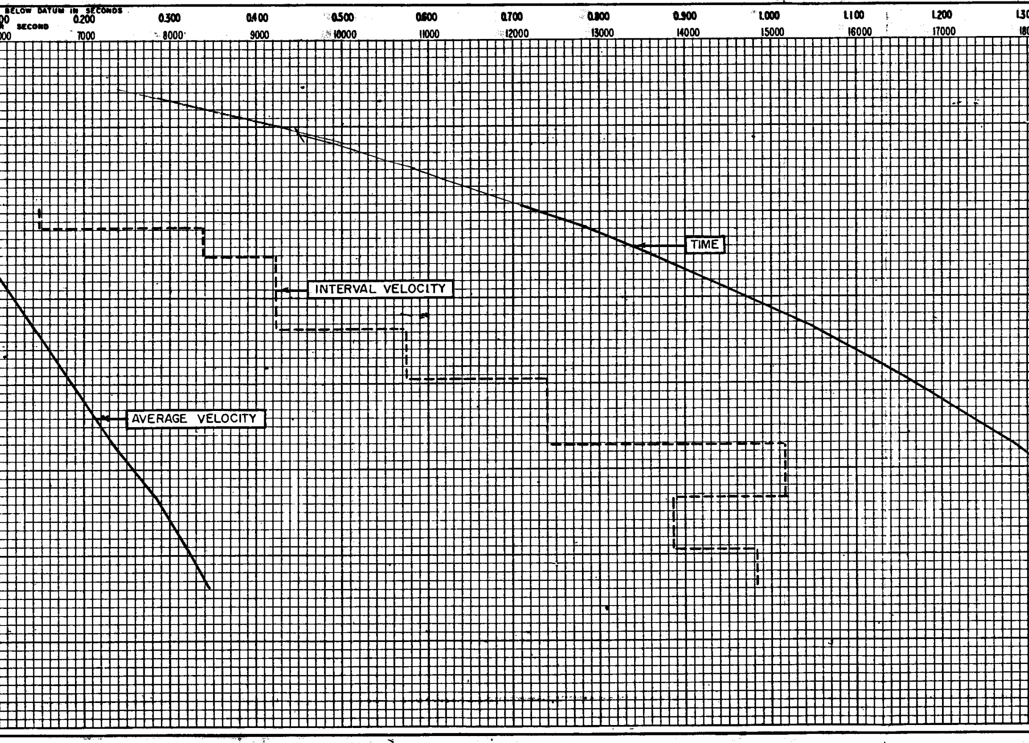
"A" side vertical times (except for the value at total depth) were not used in final results. The breaks were generally of good quality; however, times led "B" values excessively.

*The vertical time at 9,000' was not used in final results; since the depth below log datum appears to be approximately 100 feet shallow.

The correction velocity of 4885 '/" was determined using the measured salinity (22,000 PPM) of the sea water at a temperature of 58° Fahrenheit.

## VELOCITY CURVES

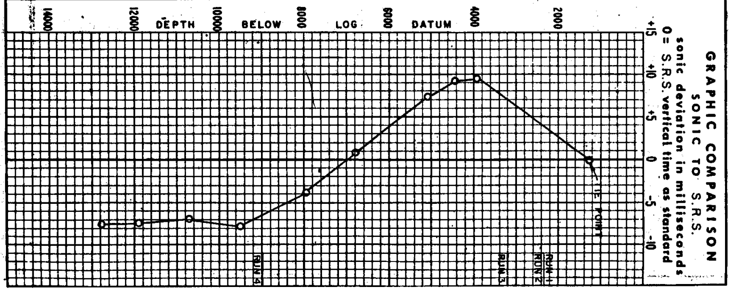




# TIME COMPARISON

| DEPTHS BELOW | | S.R.S. | SONIC LOG - UNADJUSTED | | | | | | SONIC LOG - ADJUSTED | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Log Datum K.B. | Seismic Datum S.L. | VERTICAL TIME | VERTICAL TIME | AVERAGE VELOCITY | INTERVAL DEPTH | INTERVAL TIME | INTERVAL VELOCITY | DIFFERENCE | DIFFERENCE | VERTICAL TIME | AVERAGE VELOCITY | INTERVAL DEPTH | INTERVAL TIME | INTERVAL VELOCITY |
| *1247 | 1208 | .2480 | .2480 | 4871 | | | | ±.0000 | ±.0000 | 496<br>.2480 | 4871 | | | |
| | | | | | 1940 | .3300 | 5879 | | | | | 1940 | .3199 | 6064 |
| 3187 | 3148 | | .5780 | 5446 | | | | | | 1136<br>.5679 | 5543 | | | |
| | | | | | 743 | .1410 | 5270 | | | | | 743 | .1411 | 5266 |
| 3930 | 3891 | .7095 | .7190 | 5412 | | | | +.0095 | -.0005 | 1.418<br>.7090 | 5488 | | | |
| | | | | | 490 | .0751 | 6525 | | | | | 490 | .0755 | 6490 |
| 4420 | 4381 | .7850 | .7941 | 5517 | | | | +.0091 | -.0005 | 1.570<br>.7845 | 5584 | | | |
| | | | | | 680 | .0792 | 8586 | | | | | 680 | .0808 | 8416 |
| 5100 | 5061 | .8660 | .8733 | 5795 | | | | +.0073 | -.0007 | 1.130<br>.8653 | 5849 | | | |
| | | | | | 1700 | .1777 | 9567 | | | | | 1700 | .1845 | 9214 |
| 6800 | 6761 | 1.0500 | 1.0510 | 6433 | | | | +.0010 | -.0002 | 2100<br>1.0498 | 6440 | | | |
| | | | | | 1150 | .1021 | 11263 | | | | | 1150 | .1066 | 10788 |
| 7950 | 7911 | 1.1570 | 1.1531 | 6861 | | | | -.0039 | -.0006 | 2312<br>1.1564 | 6841 | | | |
| | | | | | 1050 | .0852 | 12324 | | | | | 1050 | .0892 | 11771 |
| 9000 | 8961 | | 1.2383 | 7237 | | | | | | 2492<br>1.2456 | 7194 | | | |
| | | | | | 500 | .0358 | 13966 | | | | | 500 | .0359 | 13928 |
| 9500 | 9461 | 1.2820 | 1.2741 | 7426 | | | | -.0079 | -.0005 | 2564<br>1.2815 | 7383 | | | |
| | | | | | 1200 | .0799 | 15019 | | | | | 1200 | .0799 | 15019 |
| 10700 | 10661 | 1.3610 | 1.3540 | 7874 | | | | -.0070 | +.0004 | 2722<br>1.3614 | 7831 | | | |
| | | | | | 1250 | .0897 | 13935 | | | | | 1250 | .0896 | 13951 |
| 11950 | 11911 | 1.4510 | 1.4437 | 8250 | | | | -.0073 | ±.0000 | 2.902<br>1.4510 | 8209 | | | |
| | | | | | 830 | .0560 | 14821 | | | | | 830 | .0560 | 14821 |
| 12780 | 12741 | 1.5070 | 1.4997 | 8496 | | | | -.0073 | ±.0000 | 3.014<br>1.5070 | 8455 | | | |

* TOP OF THE LOG.



NORMAL MOVE OUT CHART
COMPUTED FROM TIME DEPTH POINTS
FIRST LINE --- REFLECTION TIMES
SECOND LINE --- NMO TIMES AT INDICATED SPREADS

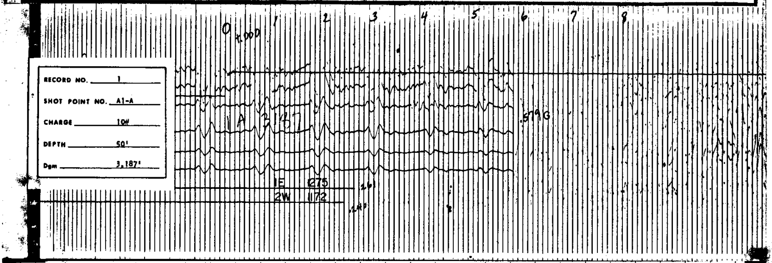
| CENTER TRACE-TIME | 660. SPRD1 | 1320. SPRD2 | 1980. SPRD3 | 2640. SPRD4 | 5280. SPRD5 | 7920. SPRD6 | 10560. SPRD7 |
|---|---|---|---|---|---|---|---|
| 0.200 | 0.2415 | 0.3368 | 0.4530 | 0.5777 | 1.1022 | 1.6382 | 2.1771 |
| | 0.0415 | 0.1368 | 0.2530 | 0.3777 | 0.9022 | 1.4382 | 1.9771 |
| 0.400 | 0.4223 | 0.4831 | 0.5702 | 0.6736 | 1.1554 | 1.6744 | 2.2045 |
| | 0.0223 | 0.0831 | 0.1702 | 0.2736 | 0.7554 | 1.2744 | 1.8045 |
| 0.600 | 0.6143 | 0.6553 | 0.7186 | 0.7988 | 1.2135 | 1.6921 | 2.1932 |
| | 0.0143 | 0.0553 | 0.1186 | 0.1988 | 0.6135 | 1.0921 | 1.5932 |
| 0.800 | 0.8099 | 0.8391 | 0.8856 | 0.9468 | 1.2908 | 1.7172 | 2.1782 |
| | 0.0099 | 0.0391 | 0.0856 | 0.1468 | 0.4908 | 0.9172 | 1.3782 |
| 1.000 | 1.0073 | 1.0291 | 1.0644 | 1.1120 | 1.3951 | 1.7689 | 2.1875 |
| | 0.0073 | 0.0291 | 0.0644 | 0.1120 | 0.3951 | 0.7689 | 1.1875 |
| 1.200 | 1.2059 | 1.2235 | 1.2522 | 1.2914 | 1.5335 | 1.8685 | 2.2554 |
| | 0.0059 | 0.0235 | 0.0522 | 0.0914 | 0.3335 | 0.6685 | 1.0554 |
| 1.400 | 1.4051 | 1.4205 | 1.4457 | 1.4803 | 1.6987 | 2.0106 | 2.3796 |
| | 0.0051 | 0.0205 | 0.0457 | 0.0803 | 0.2987 | 0.6106 | 0.9796 |
| 1.600 | 1.6042 | 1.6170 | 1.6381 | 1.6672 | 1.8542 | 2.1298 | 2.4644 |
| | 0.0042 | 0.0170 | 0.0381 | 0.0672 | 0.2542 | 0.5298 | 0.8644 |
| 1.800 | 1.8034 | 1.8136 | 1.8305 | 1.8539 | 2.0072 | 2.2395 | 2.5291 |
| | 0.0034 | 0.0136 | 0.0305 | 0.0539 | 0.2072 | 0.4395 | 0.7291 |
| 2.000 | 2.0027 | 2.0111 | 2.0249 | 2.0442 | 2.1714 | 2.3684 | 2.6193 |
| | 0.0027 | 0.0111 | 0.0249 | 0.0442 | 0.1714 | 0.3684 | 0.6193 |
| 2.200 | 2.2022 | 2.2089 | 2.2200 | 2.2354 | 2.3386 | 2.5010 | 2.7122 |
| | 0.0022 | 0.0089 | 0.0200 | 0.0354 | 0.1386 | 0.3010 | 0.5122 |
| 2.400 | 2.4018 | 2.4073 | 2.4164 | 2.4291 | 2.5145 | 2.6506 | 2.8303 |
| | 0.0018 | 0.0073 | 0.0164 | 0.0291 | 0.1145 | 0.2506 | 0.4303 |
| 2.600 | 2.6014 | 2.6059 | 2.6134 | 2.6237 | 2.6939 | 2.8069 | 2.9578 |
| | 0.0014 | 0.0059 | 0.0134 | 0.0237 | 0.0939 | 0.2069 | 0.3578 |

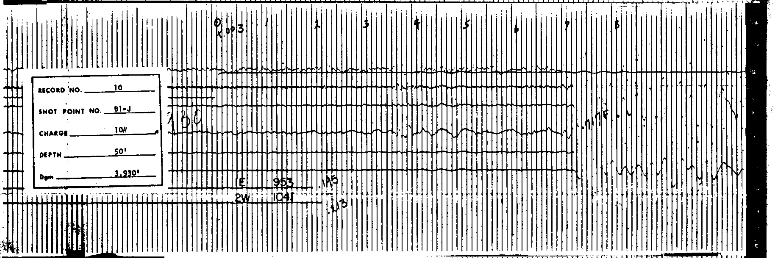
|  |  |  |  |  |  |  |  |
|---|---|---|---|---|---|---|---|
| 2.800 | 2.8012<br>0.0012 | 2.8048<br>0.0048 | 2.8109<br>0.0109 | 2.8193<br>0.0193 | 2.8766<br>0.0766 | 2.9697<br>0.1697 | 3.0954<br>0.2954 |
| 3.000 | 3.0010<br>0.0010 | 3.0040<br>0.0040 | 3.0091<br>0.0091 | 3.0163<br>0.0163 | 3.0647<br>0.0647 | 3.1438<br>0.1438 | 3.2513<br>0.2513 |
| 3.200 | 3.2009<br>0.0009 | 3.2038<br>0.0038 | 3.2085<br>0.0085 | 3.2151<br>0.0151 | 3.2603<br>0.0603 | 3.3342<br>0.1342 | 3.4351<br>0.2351 |

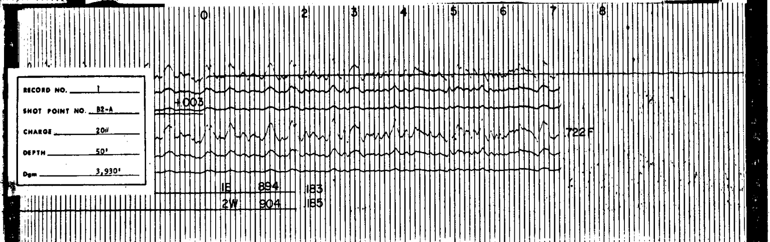
## VELOCITY RECORDS – TRACE ARRANGEMENT

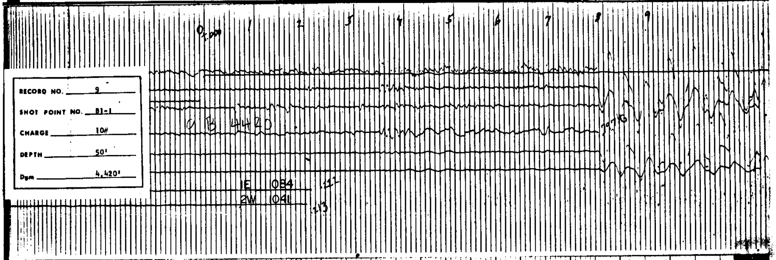
| | | | |
|---|---|---|---|
| * TRACE | 1 | WELL GEOPHONE (GULF), HIGH GAIN |
| * TRACE | 2 | WELL GEOPHONE (GULF), MEDIUM GAIN |
| * TRACE | 3 | WELL GEOPHONE (GULF), LOW GAIN |
| TRACE | 4 | TIME BREAK |
| ** TRACE | 5 | WELL GEOPHONE (GULF), HIGH GAIN |
| ** TRACE | 6 | WELL GEOPHONE (GULF), MEDIUM GAIN |
| ** TRACE | 7 | WELL GEOPHONE (GULF), LOW GAIN |
| TRACE | 8 | REFERENCE HYDROPHONE 197' EAST OF THE WELL |
| TRACE | 9 | REFERENCE HYDROPHONE 160' WEST OF THE WELL |

| | |
|---|---|
| * NF-100 | NO AUTOMATIC GAIN CONTROL |
| ** NF-82 | NO AUTOMATIC GAIN CONTROL |


RECORD NO. 1
SHOT POINT NO. A1-A
CHARGE 10#
DEPTH 50'
Dgm 3,187'


RECORD NO. 10
SHOT POINT NO. B1-J
CHARGE 10#
DEPTH 50'
Dgm 3,930'


RECORD NO. 1
SHOT POINT NO. B2-A
CHARGE 20#
DEPTH 50'
Dgm 3,930'



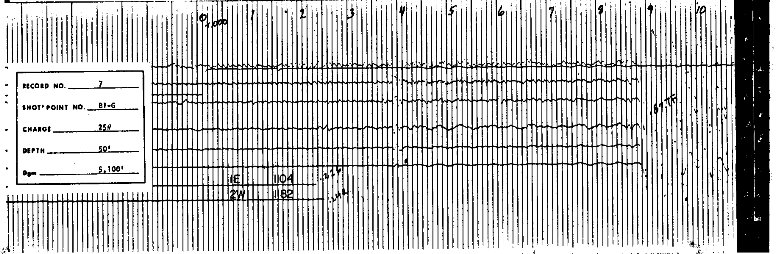
RECORD NO. 9

SHOT POINT NO. B1-I

CHARGE 10#

DEPTH 50'

Dgm 4,420'



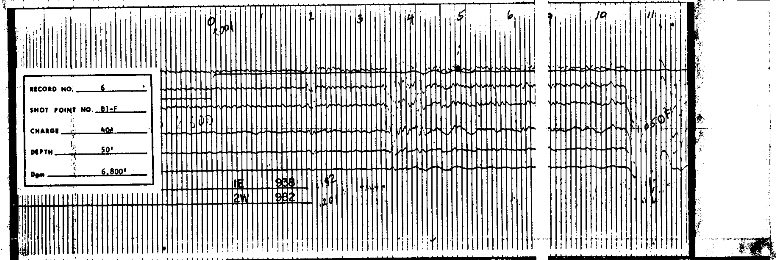
RECORD NO. 7

SHOT POINT NO. B1-G

CHARGE 25#

DEPTH 50'

Dgm 5,100'



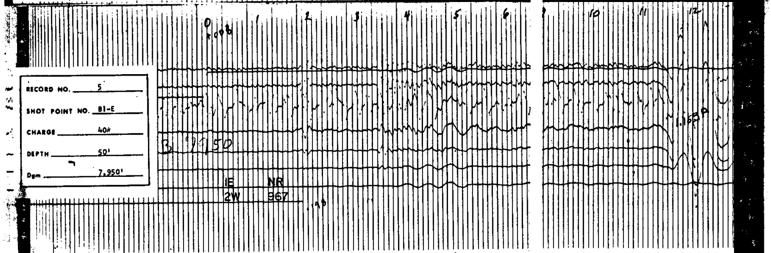
RECORD NO. 6

SHOT POINT NO. B1-F

CHARGE 40#

DEPTH 50'

Dgm 6,800'



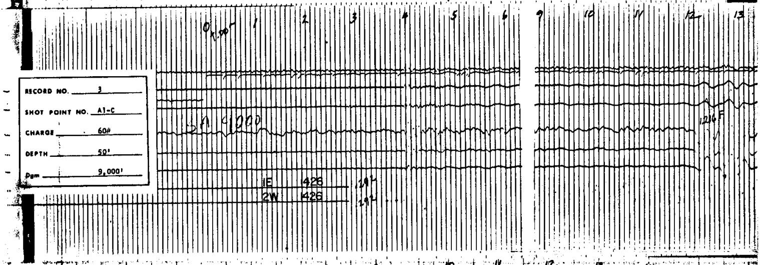
RECORD NO. 5

SHOT POINT NO. B1-E

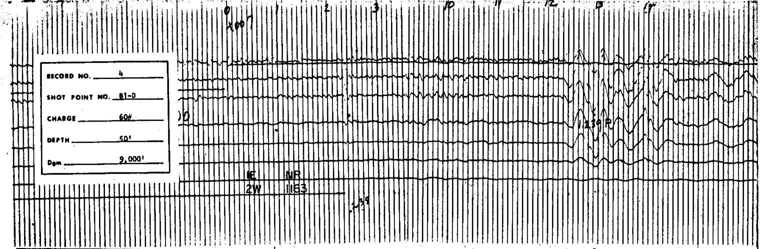
CHARGE 40#

DEPTH 50'

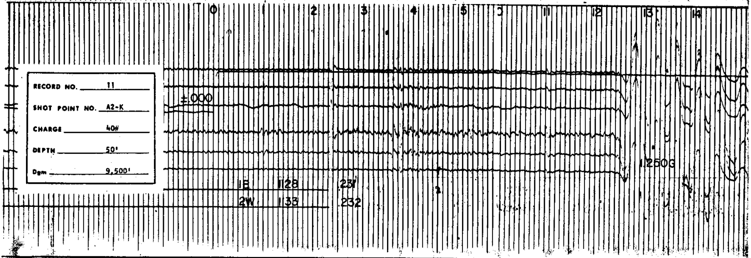
Dgm 7,950'



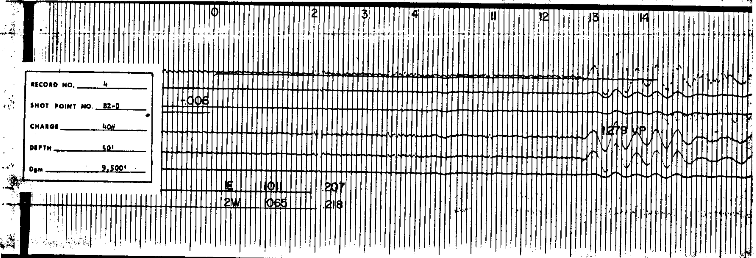
RECORD NO. 3
SHOT POINT NO. A1-C
CHARGE 60#
DEPTH 50'
Dgm 9,000'



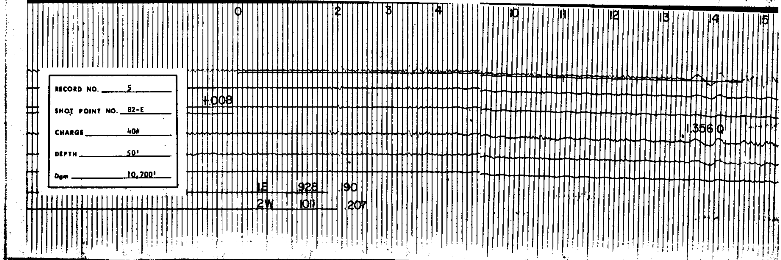
RECORD NO. 4
SHOT POINT NO. B1-D
CHARGE 60#
DEPTH 50'
Dgm 9,000'



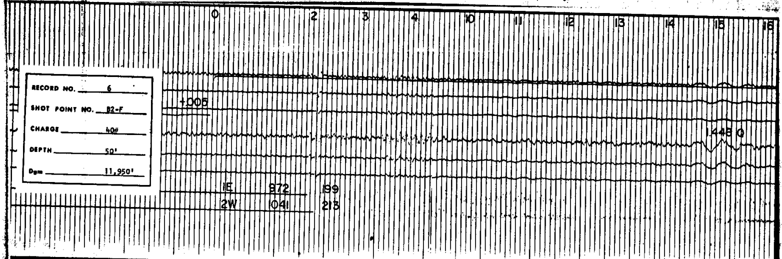
RECORD NO. 11
SHOT POINT NO. A2-K
CHARGE 40#
DEPTH 50'
Dgm 9,500'



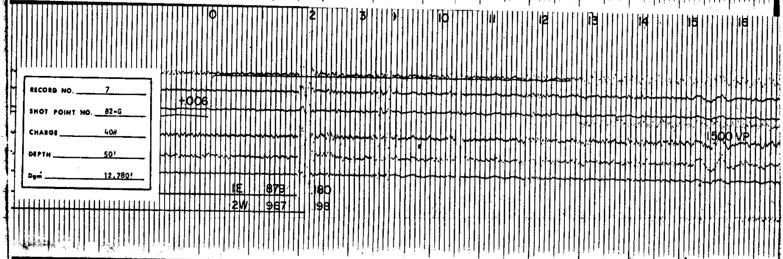
RECORD NO. 4
SHOT POINT NO. B2-D
CHARGE 40#
DEPTH 50'
Dgm 9,500'



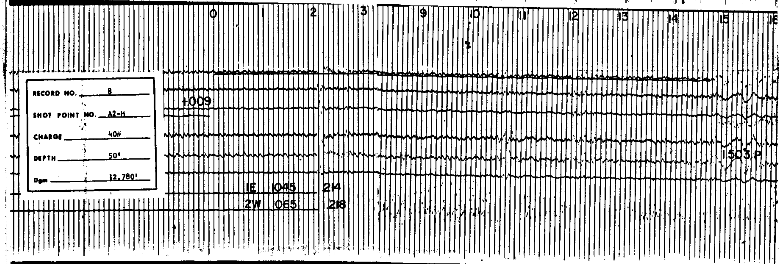
RECORD NO. 5
SHOT POINT NO. B2-E
CHARGE 40#
DEPTH 50'
Dgm 10,700'



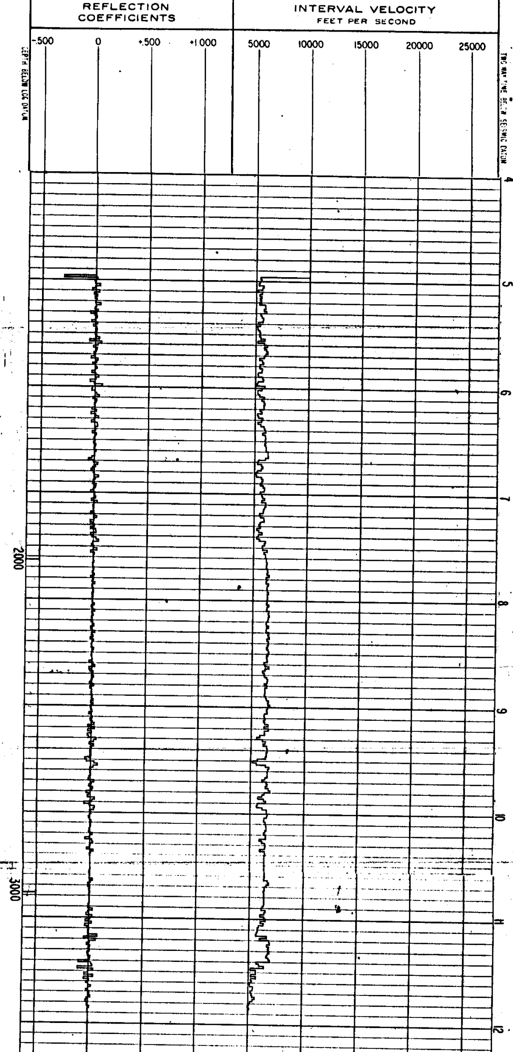
RECORD NO. 6
SHOT POINT NO. B2-F
CHARGE 40#
DEPTH 50'
Dgm 11,950'

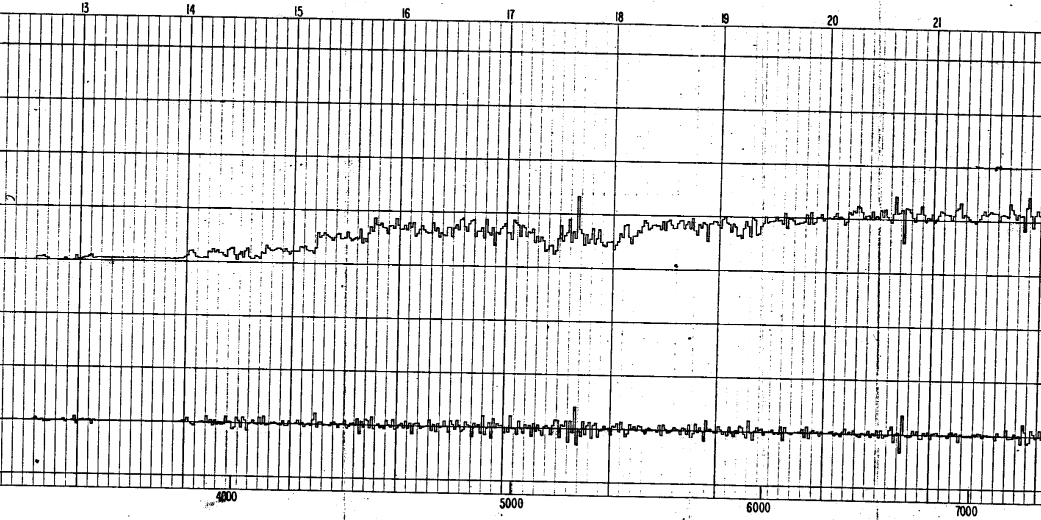


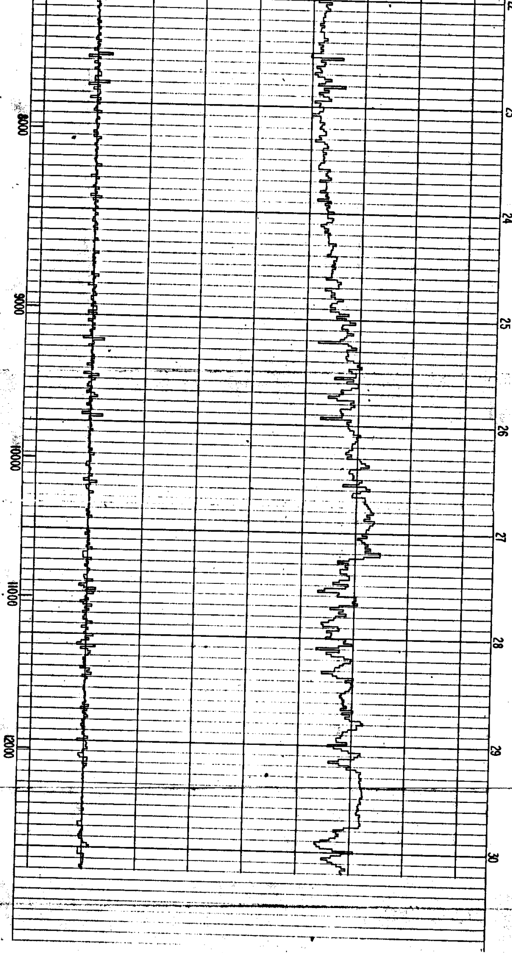
RECORD NO. 7
SHOT POINT NO. B2-G
CHARGE 40#
DEPTH 50'
Dgm 12,780'



RECORD NO. 8
SHOT POINT NO. A2-H
CHARGE 40#
DEPTH 50'
Dgm 12,780'







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