COMPANY: HUMBLE OIL & REFINING CO.

WELL: OSC P-231 No. / WODECO IV

KELLY BUSHING +38' | ROTARY TABLE | DERRICK FLOOR | GROUND -994'

COORDINATE / SECTION: OFFSHORE SANTA BARBARA, CALIFORNIA

CONFIDENTIAL

RECORD NUMBER	SHOT HOLE NUMBER	Dgm	Tus	Tc	Ds	Δe	Dws	Δsd	Dgs	H	Cot i	Cos i	T	GRADE	Tgs	Δsd/V_1	Tgd	Dgd	ΔTgd	ΔDgd	V_i INTERVAL VELOCITY	V_a AVERAGE VELOCITY
P		2300			50'	38	88	-944	2212	893	2.4770	.9273	.464	G	.430	-.197	.233	1268	.098		10,400	5442
B		3320							~~3232~~	~~1138~~	~~2.8401~~	~~.943~~	~~.645~~	?	~~.610~~		~~.413~~	~~2288~~	.176	1020	5,790	[illegible]
N		3320							~~3232~~	~~936~~	~~3.4530~~	~~.9605~~	[illegible]	?	~~.608~~		~~.411~~	~~2388~~	.044		9320	[illegible]
L		3730							~~3642~~	~~864~~	~~4.2153~~	~~.9730~~	~~.684~~	G	~~.666~~		~~.469~~	2698	.100	410	[illegible]	7200
K		4300							~~4212~~	~~864~~	~~4.8750~~	~~.9796~~	~~.715~~	P	~~.700~~		~~.508~~	3268	.103	570	16,765	6497
J		5600							5512	931	5.9205	.9860	.755	G	.754		OK .587	4568	.054	1300	11,189 476	7782 7720
I		7000							6912	806	8.5757	.9933	917 ~~.918~~	F	911 ~~.912~~		714 ~~.715~~	5968	.128	1400	10,938	8347
H		7500							7412	859	8.6286	.9933	954 .953	F	950 .947		753 ~~.750~~	6468	.035	500	14,286	8624
G		7920							7832	845	9.2686	.9942	.990	G	.984		OK .787	6888	.037	420	11,351	8752
F		8700							8612	893	9.6439	.9947	1.048	F	1.042		845 ~~.843~~	7668	.056	780	13,929	9096
D		9000							8912	1200	7.4267	.9911	1074 ~~1.069~~	P	1064 ~~1.059~~		.867 ~~.892~~	7968	.019	300	15,789	9244
C		9490							9402	1190	7.9001	.9921	1.109	P	1.100 1101		903 ~~.901~~	8458				9387*
E		9490			50'	38	88	-944	9402	1032	9.1105	.9940	1.110	G	1103 ~~1.094~~	-.197	906 .897	8458	.035	490	14,000	9429
c													1.1?9		[illegible]		904					
E													1.110		1.103	1101						

* B & C not used in computation of interval velocities

Note: check shots B, N, L & K are not reliable and can not be used.
HK King
7-22-69

(1.050)(2100)
8962 - (1.047)(2205)
9452 S.D.

GEOLOGICAL SURVEY
RECEIVED
JUN 04 1979
LOS ANGELES

SHOTHOLE ELEVATION +38' | WELL ELEVATION

50' Ds | SHOT | DATUM PLANE ELEVATION -994' | H | Δe | Dws | Dwd | Δsd | Dgs | Dgd | Dgm

T.D. 9647

Dwd = Kelly elevation minus datum elevation. =1032'

Dgm = Seismometer depth below kelly elevation.

Tus = Uphole time of shot

Tc = Time correction. (from reflection, refraction, or uphole time).

Ds = Depth of shot.

Δe = Kelly elevation minus shothole elevation. = 38'

Dws = Ds + Δe

Δsd = Dws - Dwd

Dgs = Dgm - Dws

H = Horizontal distance, well to shothole.

Cot i = Dgs/H

T = Well seismometer time from time break.

Tgs = T Cot i

Tgd = Tgs + Δsd/V_1 = Vertical travel time, well seismometer to datum plane.

Dgd = Dgm - Dwd = Vertical distance, well seismometer to datum plane.

V_i = Interval velocity = ΔDgd/ΔTgd

V_a = Average velocity = Dgd / Tgd

WELL VELOCITY SURVEY

Bendix | United Geophysical Corporation

SURVEYED FOR: Humble Oil & Ref. Co.

SURVEYED BY: United Party 503

COMPUTED BY: E.H. Harris

DATE SURVEYED: Sept. 14, 1968

CASING: 4463'

V^1 = 4800'/s Water Velocity

WEATHERING:

OCS-P-0231 No-1

Bendix
United Geophysical Corporation
2650 E Foothill Boulevard
Pasadena, California 91109
Tel (213) 795-0421
A Subsidiary of The Bendix Corporation

WELL VELOCITY SURVEY

TO: Humble Oil & Refining Company

FROM: United Geophysical Corporation

DATE: September 14, 1968

SUBJECT: Well Survey, Well No. OSC P-231 No. 1

United Geophysical Corporation's Party 503 conducted a well velocity survey for Humble Oil & Refining Company in Humble's well, OSC P-231 No. 1, on September 14, 1968.

The total depth of the well was 9,647 feet. A pressure sensitive (SSC Model 640) well geophone was used for the survey. Recordings were taken to a depth of 9,452 feet. The well was cased to 4,463 feet.

Geophone Survey

Fifteen shots of twenty pounds each were dropped from the Pike X, used as a shooting boat, at distances from the well ranging from 845 to 1,200 feet. The shot depth was fifty feet. Only thirteen of the shots could be used. Three reference geophones were used to locate the charge distance from the well. These were located as follows: One at each

Bendix
United Geophysical Corporation

end of the drilling barge and one in the center. All were at a depth of fifty feet below S.L. (see Plat 1 showing location).

A water velocity of 4,800 feet/second was used to compute the distance of the shot from the well. The direction of the shot from the well was computed by converting the time differential between the two reference geophones at each end of the barge to distance. Using a sine function to find the angle which is normal to the direction from the well to the shot, the horizontal distance from each shot to the well was plotted (see Plat 1).

A datum plane of -994 feet (sea floor at well) was used to correct times and depths of the thirteen shots.

Shots were lettered from A to P. There was no record for Shot A, Shot M had no radio time break, and the letter O was not used. Shots B, C and D were fired from the north side of the barge as the well geophone was being lowered into the hole. Shots E to P were taken as the geophone was raised. These were fired from the south side of the barge. Shots B and N at a depth of 3,320 feet have questionable breaks. Shots B and C were not used in the

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United
Geophysical
Corporation

average and interval velocity chart. There was high noise level on all shots, due mainly to motors and generators aboard the drilling barge.

Three distinct velocity changes are observed from the corrected velocity survey. A slower to faster velocity is shown to occur at point N, 2,288 feet below datum, a faster to slower velocity occurs at point J, 4,568 feet below datum and a slower to faster velocity occurs at point I, 5,968 feet below datum.

Although there was a rather high noise level, the record breaks were generally fair to good. Possibly the use of more powder would increase the signal to noise ratio.

Respectfully submitted,

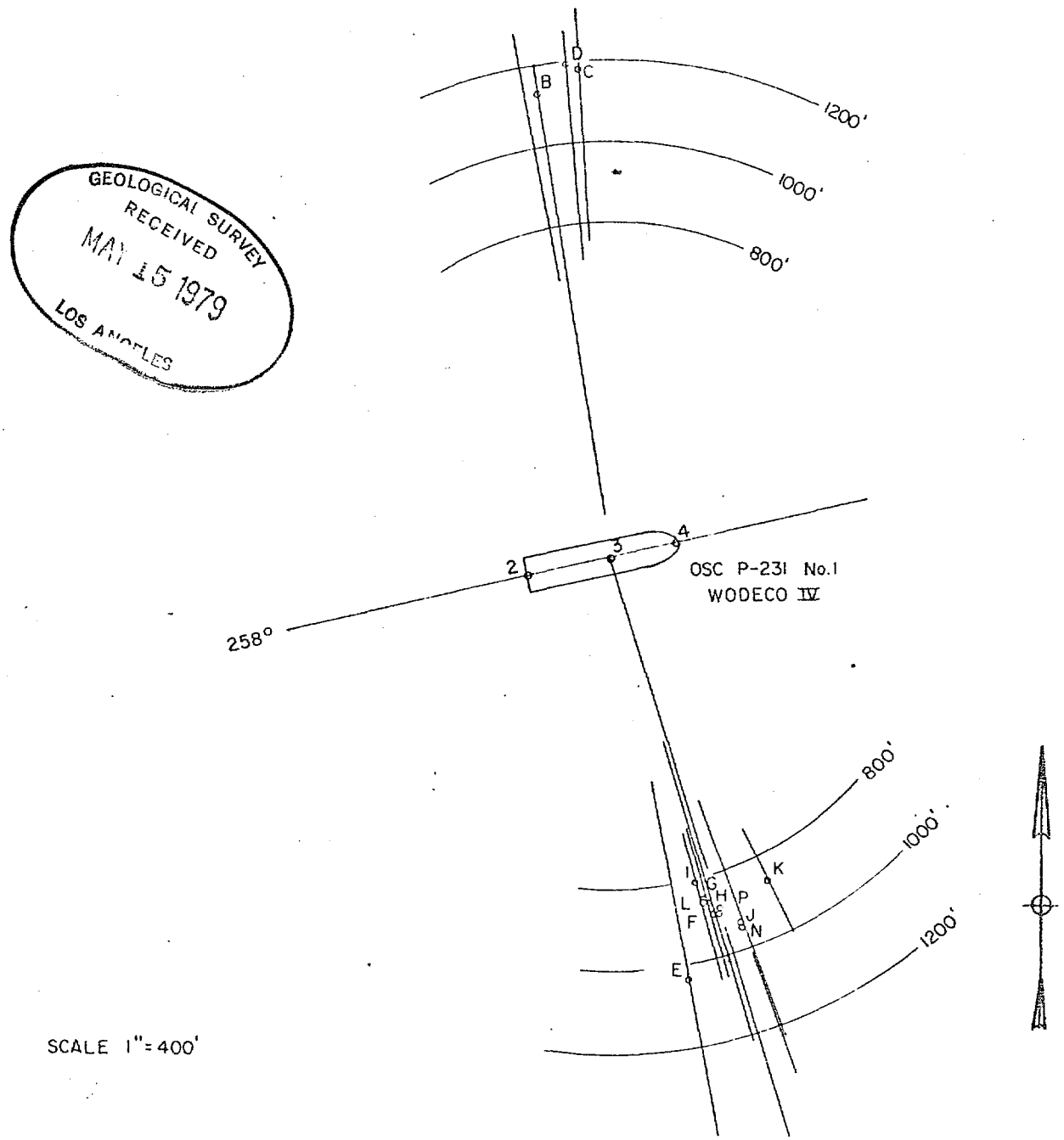
UNITED GEOPHYSICAL CORPORATION

E. H. Harris

E. H. Harris

APPROVED BY:

W. C. Cheney



SCALE 1"=400'

LOCATION PLAT SHOWING ORIENTATION OF SHOT POINTS AND REFERENCE GEOPHONES USED IN VELOCITY SURVEY OF OSC P-231
for
HUMBLE OIL & REFINING CO

PLAT No 1

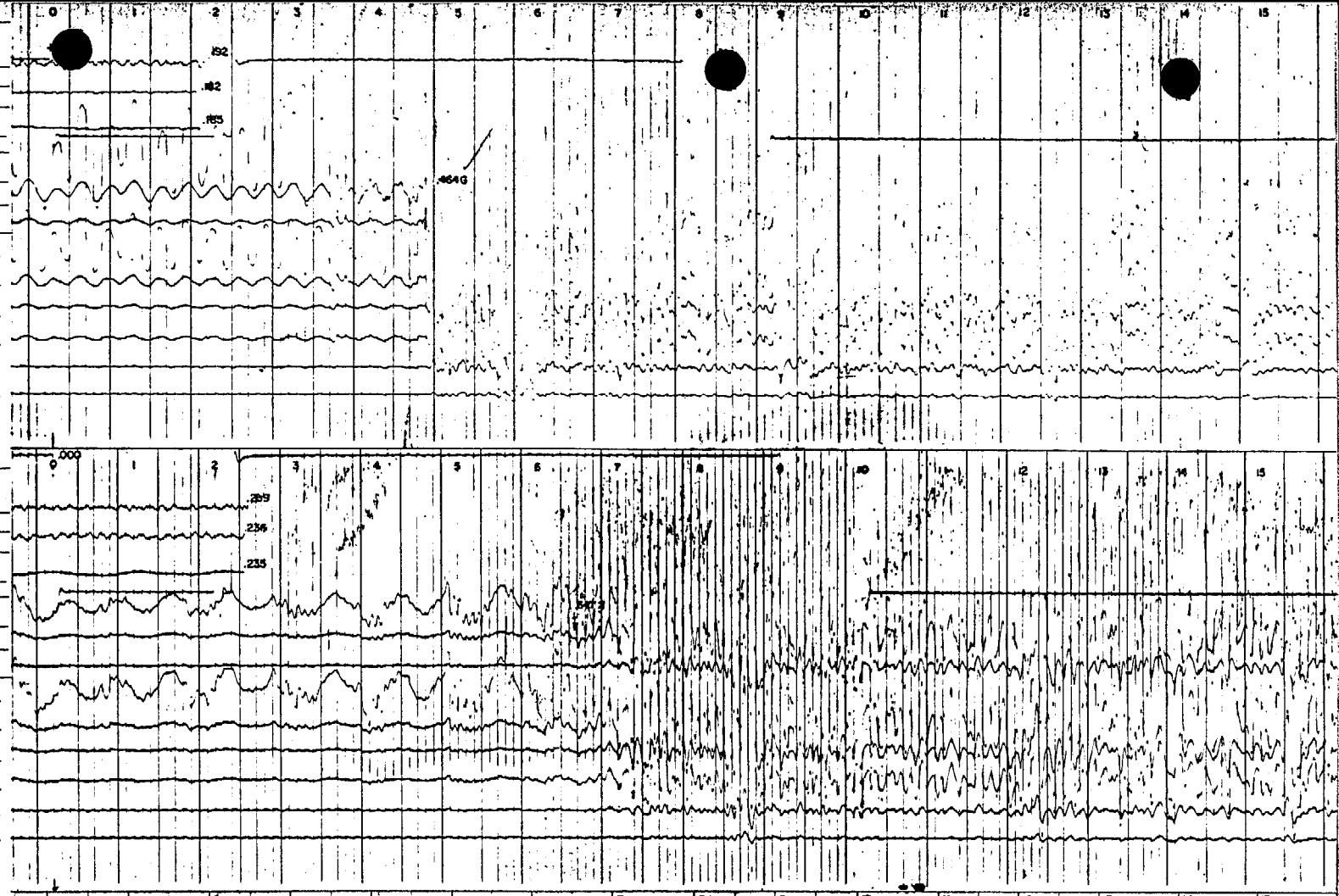
WELL VELOCITY SURVEY
HUMBLE OIL & REFINING CO.
Well: OSC P - 231 #1
Offshore California

RECORD NUMBER P
SHOT POINT NUMBER P
Depth below Kelly Bushing of:
Well Geophone 2300'
Shot Point Elevation S.L.
DEPTH OF SHOT 50 ft.
HORIZONTAL DISTANCE Surface
DYNAMITE CHARGE 20 lbs

SURVEY BY
UNITED GEOPHYSICAL CORP.
Party 503
DATE September 14, 1965

Amplifier 4 Filter 4 20 to 50 cps
Amplifier 6 & 5 Filter 6 20-150 cps

Radio Time Break
West Reference phone
Center Reference phone
East Reference phone
Well Geophone High
Well Geophone Medium
Well Geophone Low
Well Geophone 0db
Well Geophone -10db
Well Geophone -20db
Well Geophone -30db
Well Geophone -40db
Well Geophone -50db



WELL VELOCITY SURVEY
HUMBLE OIL & REFINING CO.
Well: OSC P - 231 #1
Offshore California

RECORD NUMBER B
SHOT POINT NUMBER B
Depth below Kelly Bushing of:
Well Geophone 3320'
Shot Point Elevation S.L.
DEPTH OF SHOT 50 ft.
HORIZONTAL DISTANCE Surface
DYNAMITE CHARGE 20 lbs

SURVEY BY
UNITED GEOPHYSICAL CORP.
Party 503
DATE September 14, 1965

Amplifier 4 Filter 4 20 to 50 cps
Amplifier 6 & 5 Filter 6 20-150 cps

Radio Time Break
West Reference phone
Center Reference phone
East Reference phone
Well Geophone High
Well Geophone Medium
Well Geophone Low
Well Geophone 0db
Well Geophone -10db
Well Geophone -20db
Well Geophone -30db
Well Geophone -40db
Well Geophone -50db

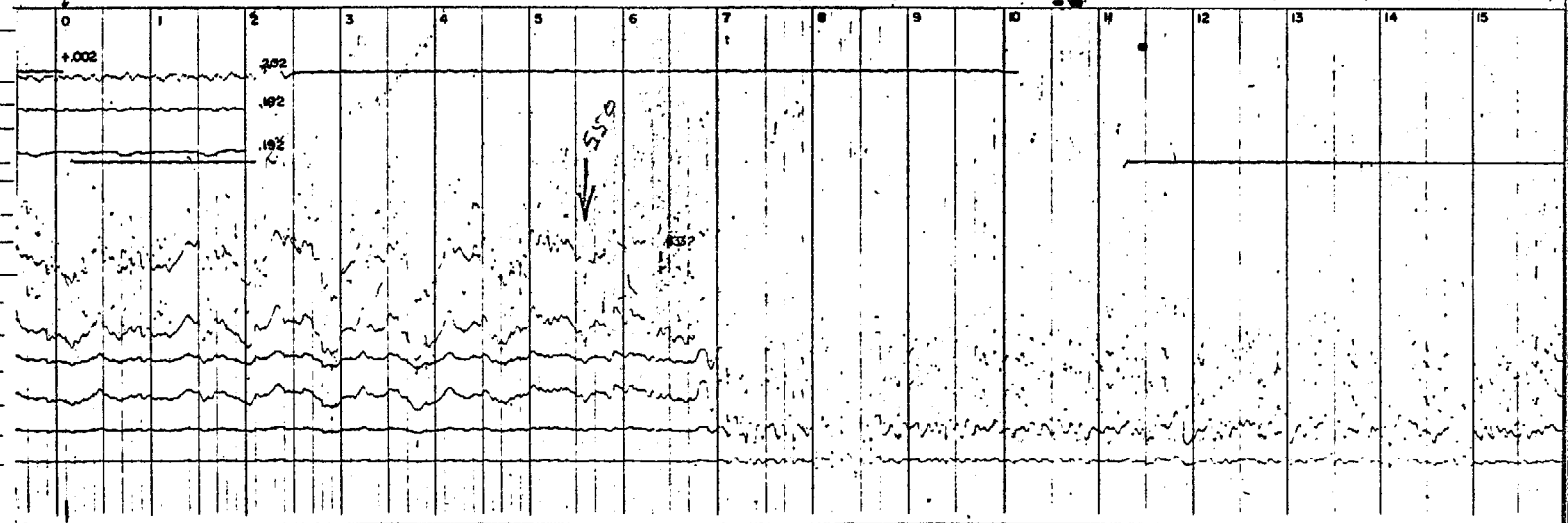
WELL VELOCITY SURVEY
HUMBLE OIL & REFINING CO.
Well: OSC P - 231 #1
Offshore California

RECORD NUMBER N
SHOT POINT NUMBER N
Depth below Kelly Bushing of:
Well Geophone 3320'
Shot Point Elevation S.L.
DEPTH OF SHOT 50 ft.
HORIZONTAL DISTANCE Surface
DYNAMITE CHARGE 20 lbs

SURVEY BY
UNITED GEOPHYSICAL CORP.
Party 503
DATE September 14, 1965

Amplifier 4 Filter 4 20 to 50 cps
Amplifier 6 & 5 Filter 6 20-150 cps

Radio Time Break
West Reference phone
Center Reference phone
East Reference phone
Well Geophone High
Well Geophone Medium
Well Geophone Low
Well Geophone 0db
Well Geophone -10db
Well Geophone -20db
Well Geophone -30db
Well Geophone -40db
Well Geophone -50db



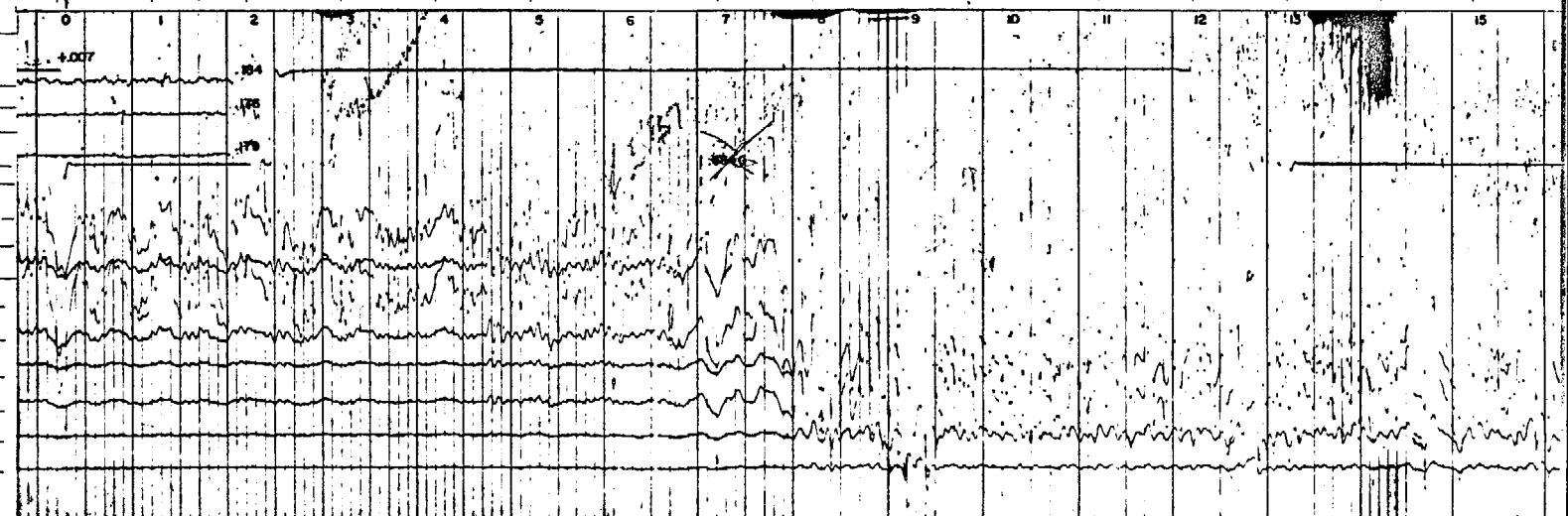
WELL VELOCITY SURVEY
HUMBLE OIL & REFINING CO.
Well: OSC P - 231 #1
Offshore California

RECORD NUMBER L
SHOT POINT NUMBER L
Depth below Kelly Bushing of:
Well Geophone 3730'
Shot Point Elevation S.L.
DEPTH OF SHOT 50 ft.
HORIZONTAL DISTANCE Surface
DYNAMITE CHARGE 20 lbs

SURVEY BY
UNITED GEOPHYSICAL CORP.
Party 503
DATE September 14, 1965

Amplifier 4 Filter 4 20 to 50 cps
Amplifier 6 & 5 Filter 6 20-150 cps

Radio Time Break
West Reference phone
Center Reference phone
East Reference phone
Well Geophone High
Well Geophone Medium
Well Geophone Low
Well Geophone 0db
Well Geophone -10db
Well Geophone -20db
Well Geophone -30db
Well Geophone -40db
Well Geophone -50db



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231-1

WELL VELOCITY SURVEY

HUMBLE OIL & REFINING CO.

Well: OSC P - 231 #1

Offshore California

RECORD NUMBER K
SHOT POINT NUMBER K
Depth below Kelly Bushing of:
Well Geophone 4300'
Shot Point Elevation S.L.
DEPTH OF SHOT 50 ft.
HORIZONTAL DISTANCE Surface
DYNAMITE CHARGE 20 lbs

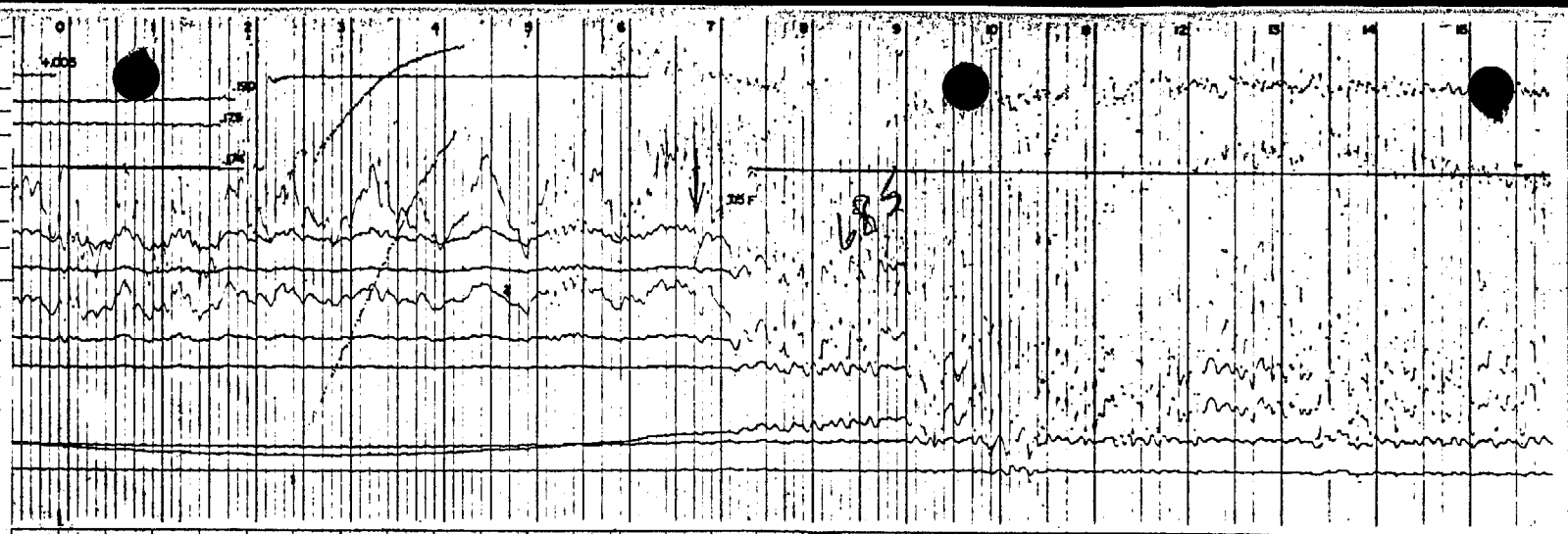
SURVEY BY
UNITED GEOPHYSICAL CORP.
Party 503
DATE September 14, 1968

Amplifier 4 Filter 4 20 to 50 cps

Radio Time Break
West Reference phone
Center Reference phone
East Reference phone
Well Geophone High
Well Geophone Medium
Well Geophone Low

Amplifier 6 & 5 Filter 6 20-150 cps

Well Geophone 0db
Well Geophone -10db
Well Geophone -20db
Well Geophone -30db
Well Geophone -40db
Well Geophone -50db



WELL VELOCITY SURVEY

HUMBLE OIL & REFINING CO.

Well: OSC P - 231 #1

Offshore California

RECORD NUMBER J
SHOT POINT NUMBER J
Depth below Kelly Bushing of:
Well Geophone 5600'
Shot Point Elevation S.L.
DEPTH OF SHOT 50 ft.
HORIZONTAL DISTANCE Surface
DYNAMITE CHARGE 20 lbs

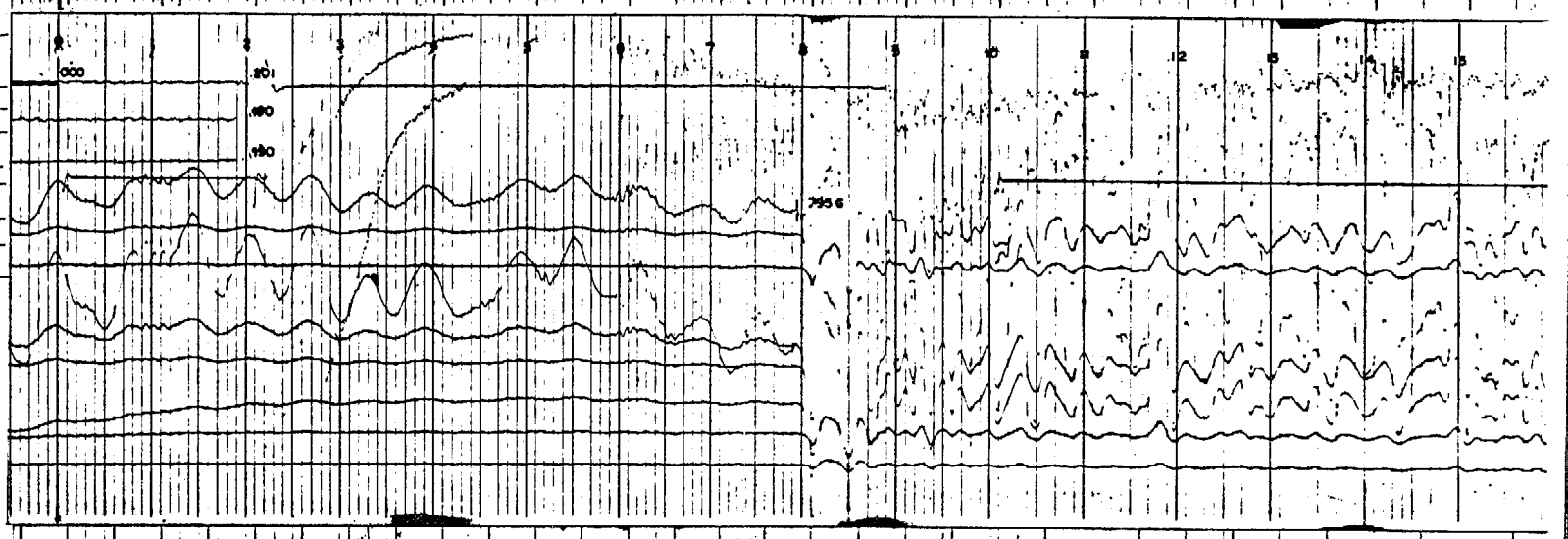
SURVEY BY
UNITED GEOPHYSICAL CORP.
Party 503
DATE September 14, 1968

Amplifier 4 Filter 4 20 to 50 cps

Radio Time Break
West Reference phone
Center Reference phone
East Reference phone
Well Geophone High
Well Geophone Medium
Well Geophone Low

Amplifier 6 & 5 Filter 6 20-150 cps

Well Geophone 0db
Well Geophone -10db
Well Geophone -20db
Well Geophone -30db
Well Geophone -40db
Well Geophone -50db



WELL VELOCITY SURVEY

HUMBLE OIL & REFINING CO.

Well: OSC P - 231 #1

Offshore California

RECORD NUMBER I
SHOT POINT NUMBER I
Depth below Kelly Bushing of:
Well Geophone 7000
Shot Point Elevation S.L.
DEPTH OF SHOT 50 ft.
HORIZONTAL DISTANCE Surface
DYNAMITE CHARGE 20 lbs

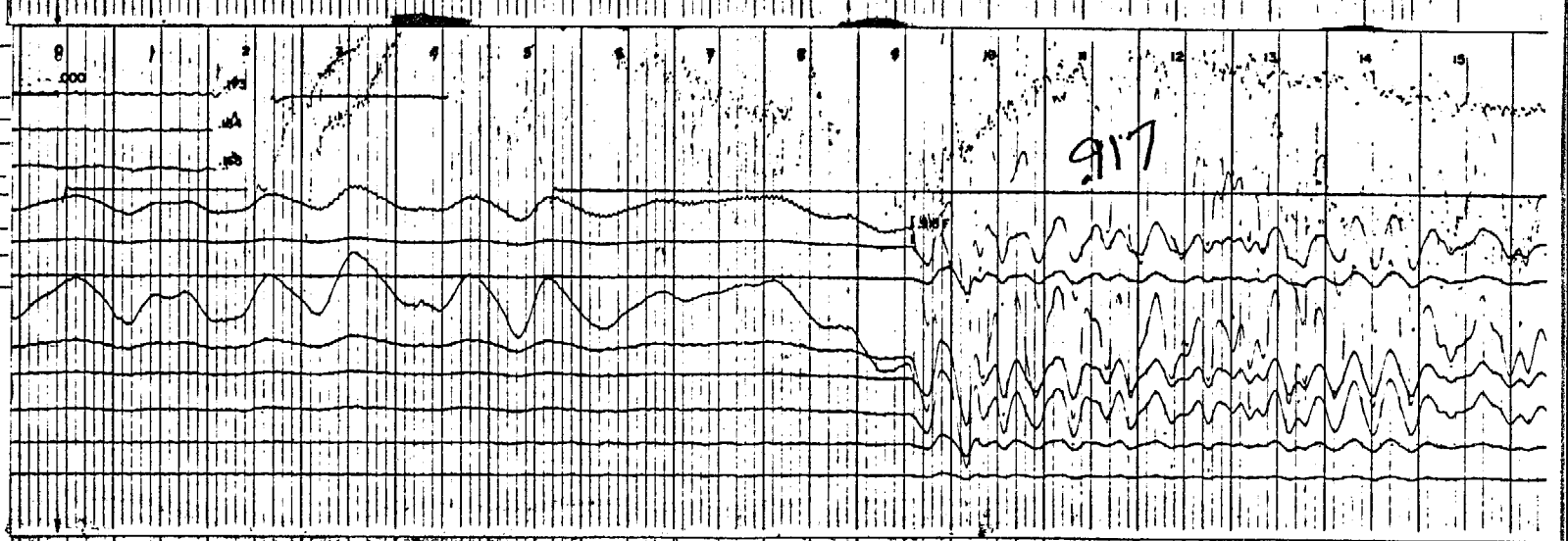
SURVEY BY
UNITED GEOPHYSICAL CORP.
Party 503
DATE September 14, 1968

Amplifier 4 Filter 4 20 to 50 cps

Radio Time Break
West Reference phone
Center Reference phone
East Reference phone
Well Geophone High
Well Geophone Medium
Well Geophone Low

Amplifier 6 & 5 Filter 6 20-150 cps

Well Geophone 0db
Well Geophone -10db
Well Geophone -20db
Well Geophone -30db
Well Geophone -40db
Well Geophone -50db



WELL VELOCITY SURVEY

HUMBLE OIL & REFINING CO.

Well: OSC P - 231 #1

Offshore California

RECORD NUMBER H
SHOT POINT NUMBER H
Depth below Kelly Bushing of:
Well Geophone 7500'
Shot Point Elevation S.L.
DEPTH OF SHOT 50 ft.
HORIZONTAL DISTANCE Surface
DYNAMITE CHARGE 20 lbs

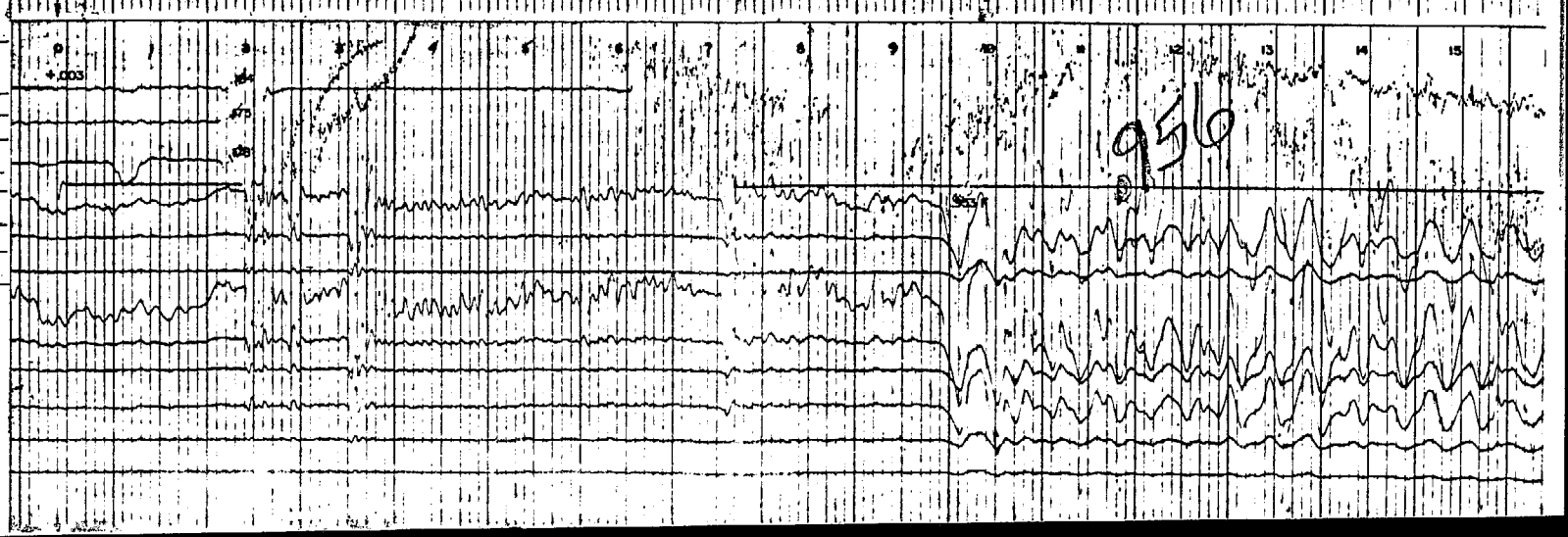
SURVEY BY
UNITED GEOPHYSICAL CORP.
Party 503
DATE September 14, 1968

Amplifier 4 Filter 4 20 to 50 cps

Radio Time Break
West Reference phone
Center Reference phone
East Reference phone
Well Geophone High
Well Geophone Medium
Well Geophone Low

Amplifier 6 & 5 Filter 6 20-150 cps

Well Geophone 0db
Well Geophone -10db
Well Geophone -20db
Well Geophone -30db
Well Geophone -40db
Well Geophone -50db



OCS-P-0231
No. 1

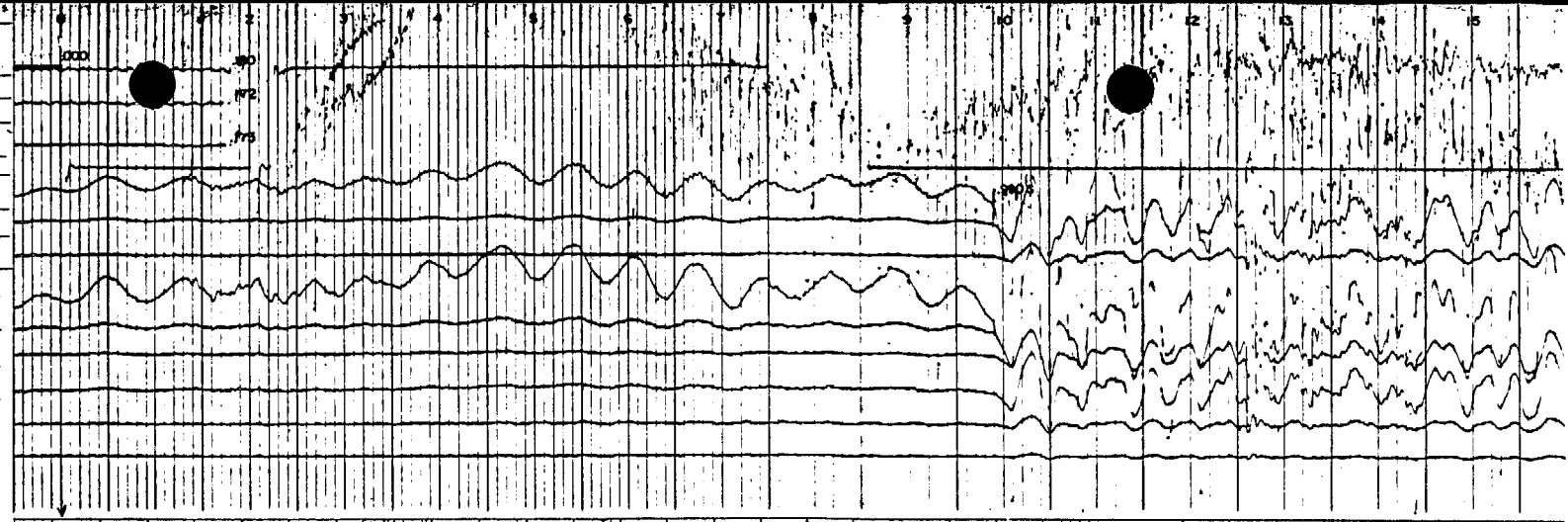
WELL VELOCITY SURVEY
HUMBLE OIL & REFINING CO.
Well: OSC P - 231 #1
Offshore California

RECORD NUMBER G
SHOT POINT NUMBER G
Depth below Kelly Bushing of:
Well Geophone 7920'
Shot Point Elevation S.L.
DEPTH OF SHOT 50 ft.
HORIZONTAL DISTANCE Surface
DYNAMITE CHARGE 20 lbs

SURVEY BY
UNITED GEOPHYSICAL CORP.
Party 503
DATE September 14, 1968

Amplifier 4 Filter 4 20 to 50 cps
Amplifier 6 & 5 Filter 6 20-150 cps

Radio Time Break
West Reference phone
Center Reference phone
East Reference phone
Well Geophone High
Well Geophone Medium
Well Geophone Low
Well Geophone 0db
Well Geophone -10db
Well Geophone -20db
Well Geophone -30db
Well Geophone -40db
Well Geophone -50db



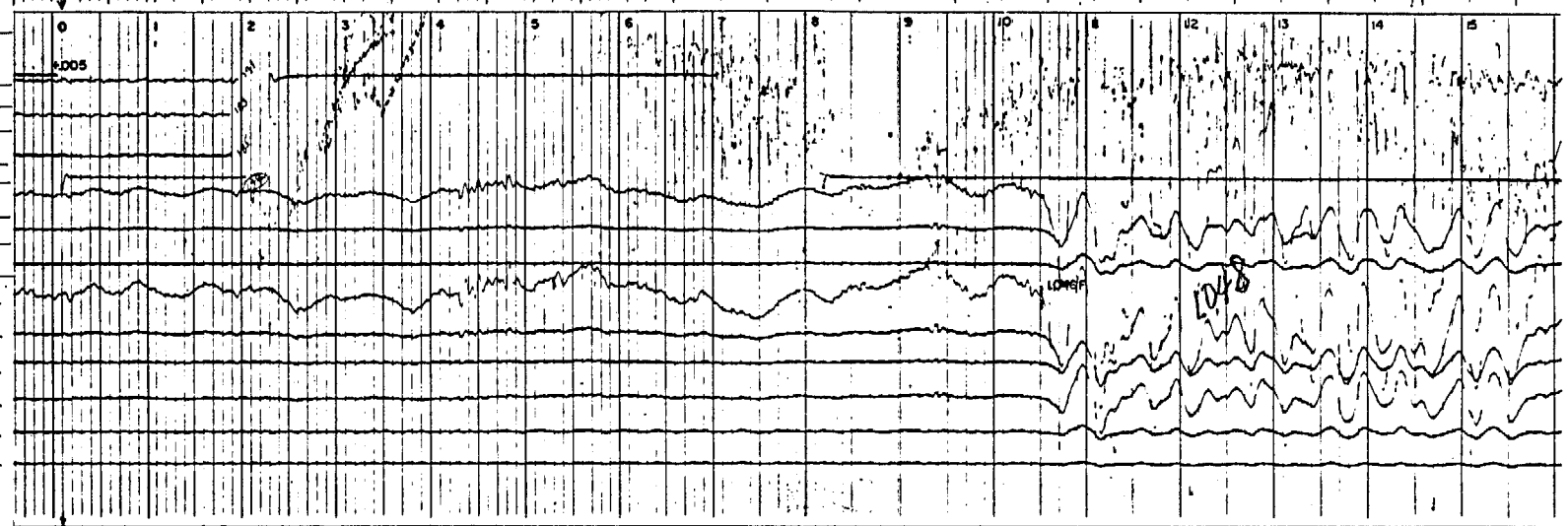
WELL VELOCITY SURVEY
HUMBLE OIL & REFINING CO.
Well: OSC P - 231 #1
Offshore California

RECORD NUMBER F
SHOT POINT NUMBER F
Depth below Kelly Bushing of:
Well Geophone 8700'
Shot Point Elevation S.L.
DEPTH OF SHOT 50 ft.
HORIZONTAL DISTANCE Surface
DYNAMITE CHARGE 20 lbs

SURVEY BY
UNITED GEOPHYSICAL CORP.
Party 503
DATE September 14, 1968

Amplifier 4 Filter 4 20 to 50 cps
Amplifier 6 & 5 Filter 6 20-150 cps

Radio Time Break
West Reference phone
Center Reference phone
East Reference phone
Well Geophone High
Well Geophone Medium
Well Geophone Low
Well Geophone 0db
Well Geophone -10db
Well Geophone -20db
Well Geophone -30db
Well Geophone -40db
Well Geophone -50db



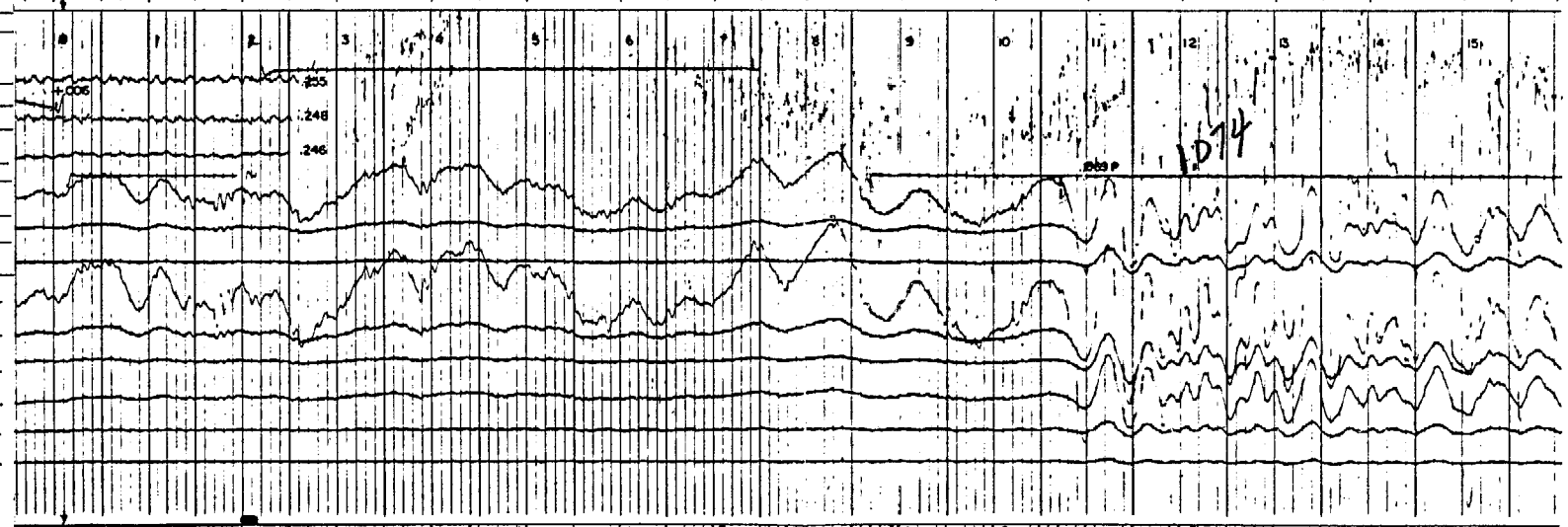
WELL VELOCITY SURVEY
HUMBLE OIL & REFINING CO.
Well: OSC P - 231 #1
Offshore California

RECORD NUMBER D
SHOT POINT NUMBER D
Depth below Kelly Bushing of:
Well Geophone 9000'
Shot Point Elevation S.L.
DEPTH OF SHOT 50 ft.
HORIZONTAL DISTANCE Surface
DYNAMITE CHARGE 20 lbs

SURVEY BY
UNITED GEOPHYSICAL CORP.
Party 503
DATE September 14, 1968

Amplifier 4 Filter 4 20 to 50 cps
Amplifier 6 & 5 Filter 6 20-150 cps

Radio Time Break
West Reference phone
Center Reference phone
East Reference phone
Well Geophone High
Well Geophone Medium
Well Geophone Low
Well Geophone 0db
Well Geophone -10db
Well Geophone -20db
Well Geophone -30db
Well Geophone -40db
Well Geophone -50db



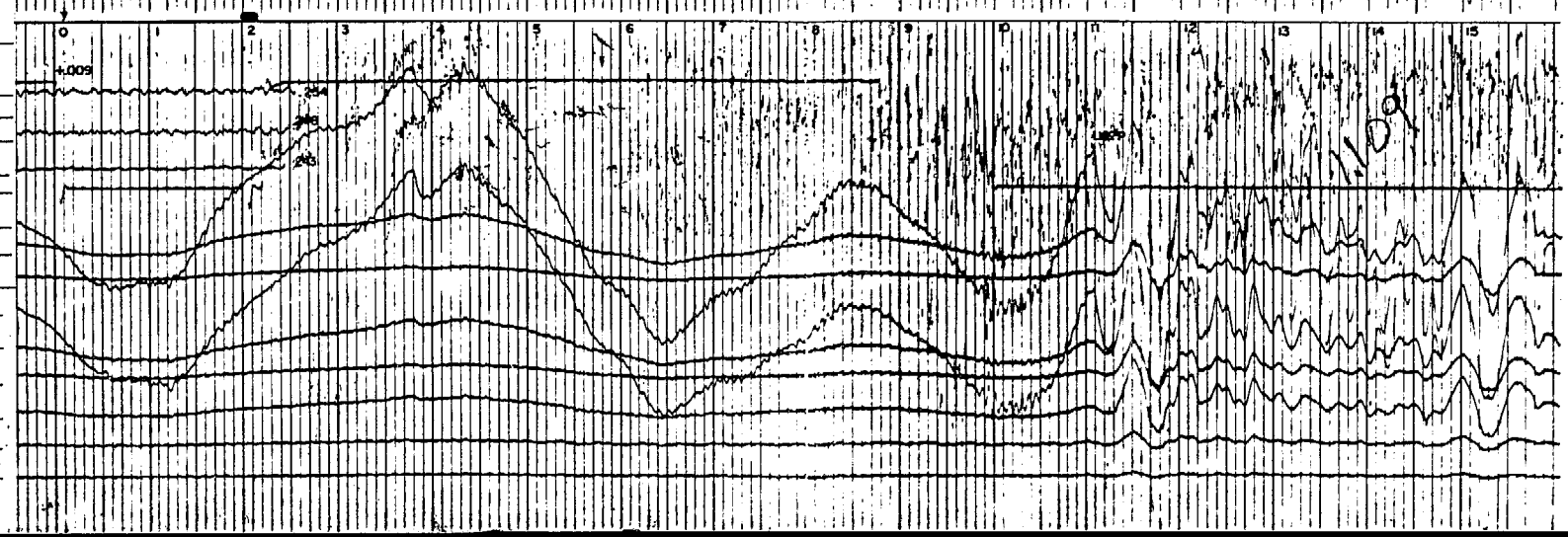
WELL VELOCITY SURVEY
HUMBLE OIL & REFINING CO.
Well: OSC P - 231 #1
Offshore California

RECORD NUMBER C
SHOT POINT NUMBER C
Depth below Kelly Bushing of:
Well Geophone 9490'
Shot Point Elevation S.L.
DEPTH OF SHOT 50 ft.
HORIZONTAL DISTANCE Surface
DYNAMITE CHARGE 20 lbs

SURVEY BY
UNITED GEOPHYSICAL CORP.
Party 503
DATE September 14, 1968

Amplifier 4 Filter 4 20 to 50 cps
Amplifier 6 & 5 Filter 6 20-150 cps

Radio Time Break
West Reference phone
Center Reference phone
East Reference phone
Well Geophone High
Well Geophone Medium
Well Geophone Low
Well Geophone 0db
Well Geophone -10db
Well Geophone -20db
Well Geophone -30db
Well Geophone -40db
Well Geophone -50db



OCS-P-0231 No.1

WELL VELOCITY SURVEY

HUMBLE OIL & REFINING CO.

Well: OSC P - 231 #1

Offshore California

RECORD NUMBER E
SHOT POINT NUMBER E
Depth below Kelly Bushing of:
Well Geophone 9490'
Shot Point Elevation S.L.
DEPTH OF SHOT 50 ft.
HORIZONTAL DISTANCE Surface
DYNAMITE CHARGE 20 lbs

SURVEY BY
UNITED GEOPHYSICAL CORP.
Party 503
DATE September 14, 1968

Amplifier 4
Filter 4
20 to 50 cps

Amplifier 6 & 5
Filter 6
20-150 cps

Radio Time Break
West Reference phone
Center Reference phone
East Reference phone
Well Geophone High
Well Geophone Medium
Well Geophone Low
Well Geophone 0db
Well Geophone -10db
Well Geophone -20db
Well Geophone -30db
Well Geophone -40db
Well Geophone -50db