FILE RB-20

RB

REPORT

ON A SEISMOGRAPH SURVEY

CONDUCTED IN

RIO BLANCO COUNTY, COLORADO

PICEANCE CREEK PROSPECT

FOR

CER GEONUCLEAR CORPORATION

LAS VEGAS, NEVADA

Seismograph Service Corporation
A SUBSIDIARY OF RAYTHEON COMPANY
P.O. BOX 1590 TULSA, OKLAHOMA

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INTRODUCTION

A seismograph survey utilizing digital magnetic recording was conducted in Township 3 South, Range 98 West, in south central Rio Blanco County, Colorado, during October 1970, for CER Geonuclear Corporation. The purpose was to determine if subsurface faulting was present over the Piceance Creek Prospect.

DISCUSSION OF RESULTS

General

Two subsurface structural maps are submitted with this report. They are designated as:

Unidentified Tertiary
Unidentified Cretaceous - Near Dakota

The depth values presented on these maps should be considered estimated and were derived by applying an estimated constant average velocity for each horizon to time values obtained from the processed cross sections. The quality of the reflected data is considered poor to fair for the Unidentified Tertiary horizon and questionable to fair for the Unidentified Cretaceous horizon. Good seismic well ties were obtained on Line 2, at the Equity Oil Company No. 1 Government Fawn Creek test in Section 14 and at the Equity Oil Company No. 1 Boies test in Section 22, T 3 S, R 98 W, for the Unidentified Tertiary horizon, but the wells were too shallow to provide a tie for the Unidentified Cretaceous horizon.

An attempt to improve the quality of the stacked data was made on Line 2, by applying fiducialized trim static corrections derived from common depth point trace gather displays. This resulted in improving the Unidentified Tertiary reflection considerably and the Unidentified Cretaceous reflection to where a more reliable interpretation of the data could be presented.

The analog magnetic tapes for Line 27 were digitized and digitally processed for 100% conventional coverage in an attempt to provide better data than the original analog processed data. The results showed no significant improvement, therefore, the original interpretation was used and the depth values adjusted to the present control.

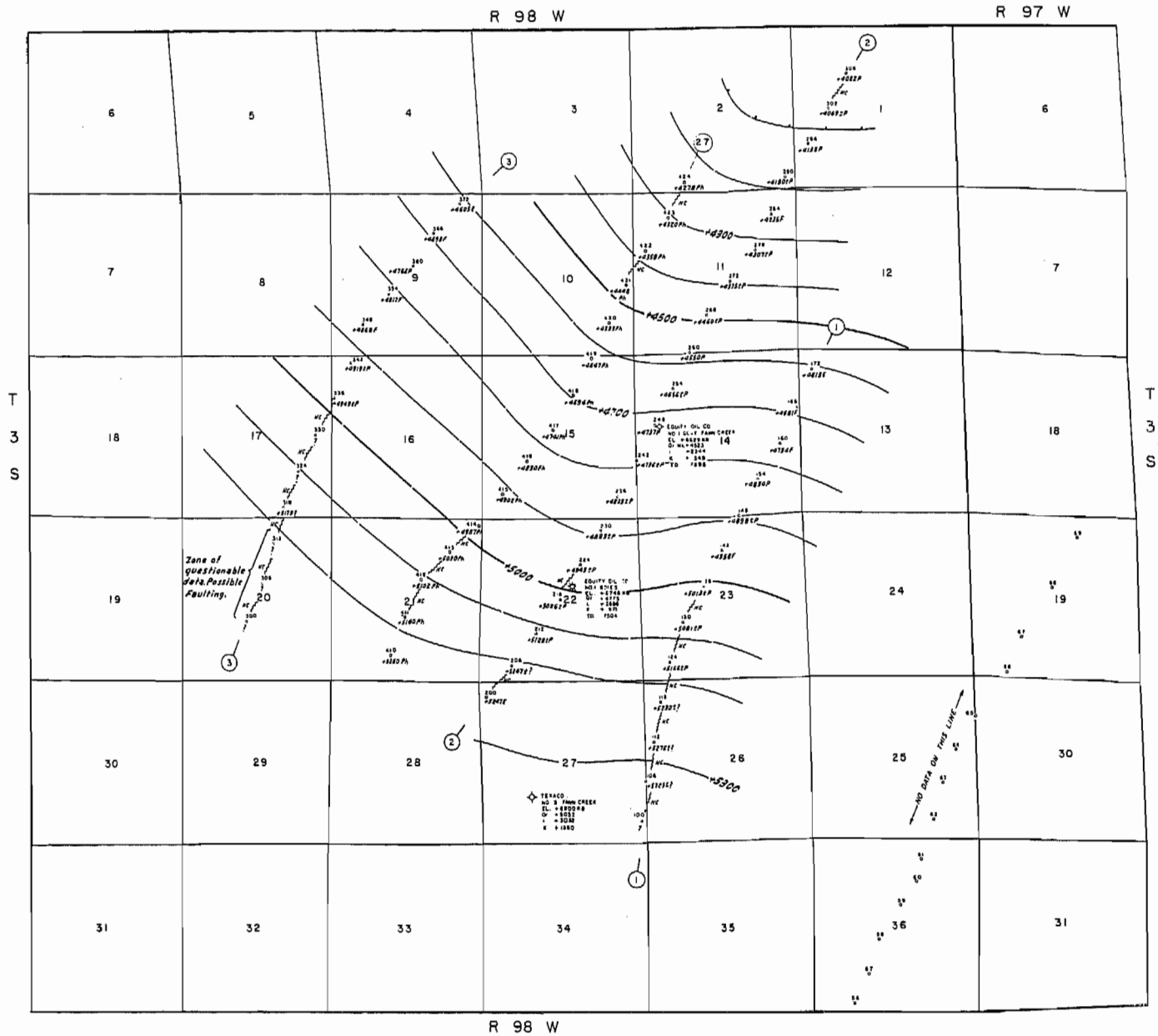
Reduced prints of both structural maps are submitted as pages 5 and 6 of this report.

Detailed Discussion

Unidentified Tertiary

The event associated with the Tertiary appears to originate approximately 200 feet above the Or. Marker zone identified in the tests in Sections 14 and 22.

The contour interpretation shows regional dip to the northeast at the rate of about 300 feet per mile. The possibility of faulting at this level appears to be limited to the southwest portion



SYMBOLS

- Shotpoint
- Depth Point
- Oil Well
- Gas Well
- Dry Hole
- Drilling Well
- Well Location
- Abandoned Oil Well
- Abandoned Gas Well
- Direction of Dip
- Two-dimensional displaced depth point with or without third dimension estimated
- Three-dimensional displaced depth point
- Contoured depression or interval thickening
- Established section or survey corner (when designated)
- Established section or survey line (when designated)

CLASSIFICATION OF DATA

G	Good or positive
F	Fair or reliable
P	Poor or possible
E	Estimated
?	Questionable
	Continuity questionable
	No continuity
RA	Reflection absent in zone being mapped
NR	No reflections at any time level
±	Accuracy not precise

CER GEONUCLEAR CORPORATION

SEISMIC MAP

PREPARED BY

Seismograph Service Corporation

Tulsa, Oklahoma, U.S.A.

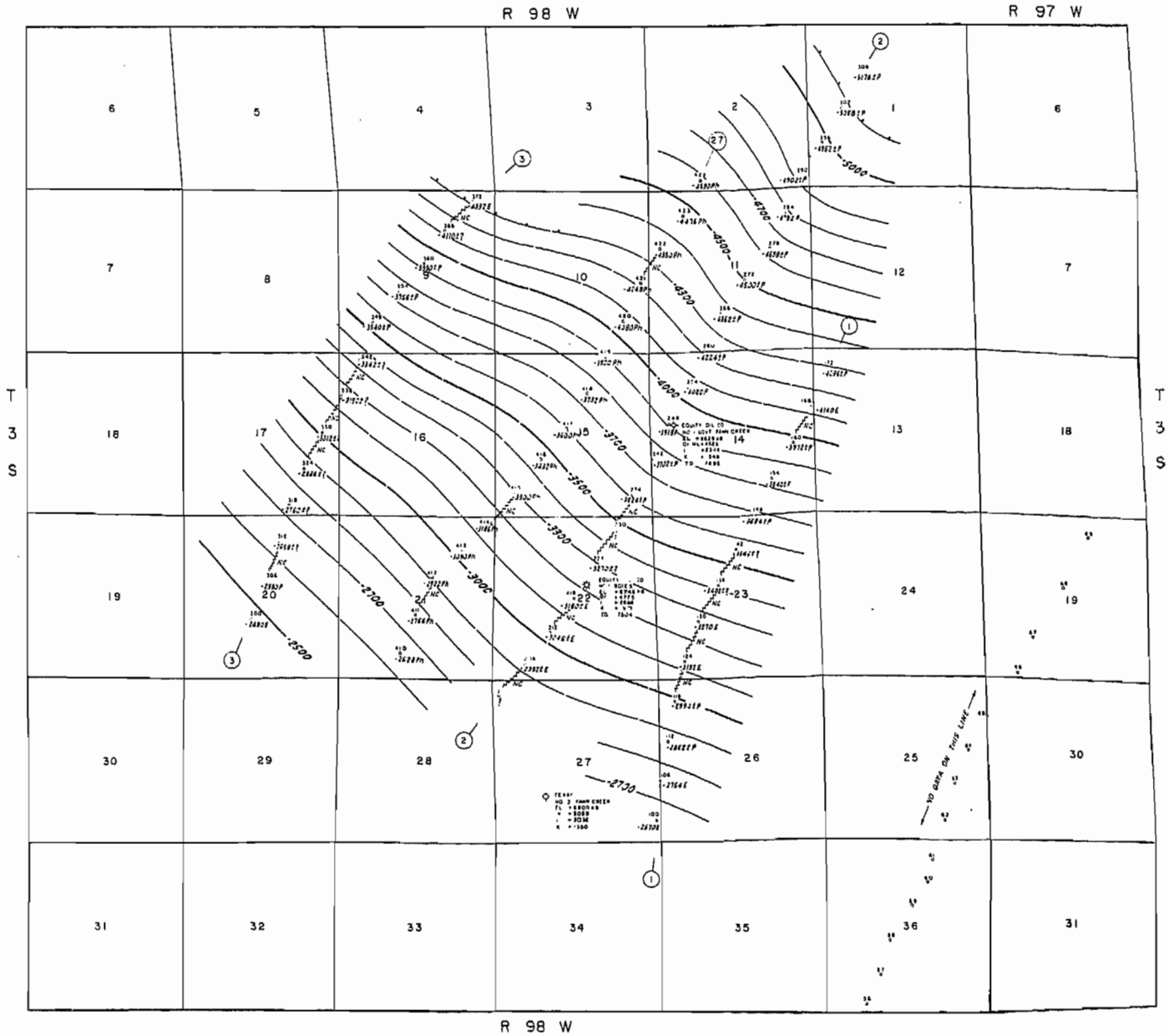
PICEANCE CREEK PROSPECT

RIO BLANCO COUNTY, COLORADO

UNIDENTIFIED TERTIARY

Contour Interval: 100 Feet
Reference Datum: Sea Level
Elevation Datum: +6900 Feet
Elevation Velocity: 7500 Ft./Sec.
Average Velocity: 8500 Ft./Sec.

Final Report Date: February 8, 1971
Contract Number: 2441-1
Party Chief: J.B. Stout
Supervisor: G.E. Randolph
Checked By: J. B. Jackson



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CER GEONUCLEAR CORPORATION

SEISMIC MAP

PREPARED BY

Seismograph Service Corporation

Tulsa, Oklahoma, U.S.A.

PICEANCE CREEK PROSPECT

RIO BLANCO COUNTY, COLORADO

UNIDENTIFIED CRETACEOUS-NEAR DAKOTA

Contour Interval: 100 Feet
Reference Datum: Sea Level
Elevation Datum: +6900 Feet
Elevation Velocity: 7500 Ft./Sec.
Average Velocity: 12,000 Ft./Sec.

Final Report Date: February 8, 1971
Contract Number: 2441-1
Party Chief: J.B. Stout
Supervisor: G.E. Randolph
Checked By: J.G. Jackson

of Line 3 in Section 20. The other areas of no continuity depicted on this horizon are believed to be caused by weak reflected data and/or poor control for the static corrections used in these areas.

Unidentified Cretaceous - Near Dakota

The Unidentified Cretaceous event is believed to be associated with the Dakota horizon and is of much poorer quality and weaker definition than the shallower horizon mapped; therefore, the interpretation presented is considered to be somewhat questionable.

Regional dip at the rate of about 550 feet per mile to the northeast appears reliably established at this level. Although faulting is a possibility in the areas of no continuity, it is believed that the lack of good static correction control and generally weak reflected data are the dominant reasons for these questionable areas. The presence of faulting is suggested on that portion of Line 3 located in Sections 17 and 20, but is not reliably defined because of the poor seismic data.

CONCLUSIONS AND RECOMMENDATIONS

The presence of regional dip varying from about 300 feet per mile on the Unidentified Tertiary horizon to about 550 feet per mile at the Unidentified Cretaceous level seems reliably established by the seismic data.

An indication of possible faulting is suggested on Line 3 in Sections 17 and 20, T 3 S, R 98 W, at both levels mapped. Further definition of the suspected faulting is questionable with the present control and poor data quality in this immediate area.

It is believed that the other questionable and no continuity areas depicted on both horizons are the result of very weak reflected data, poor control for static corrections, and an abundance of low frequency interference. It is recommended that if additional seismic exploration is undertaken in this area that at least 600% common depth point coverage be obtained, and that use of the "VIBROSEIS"* method be considered in an attempt to reduce the amount of interference generated by shotholes.

Respectfully submitted,

SEISMOGRAPH SERVICE CORPORATION

By: J. B. Stout, Party Chief

By: G. E. Randolph, Supervisor

/ho
February 8, 1971

Checked by:

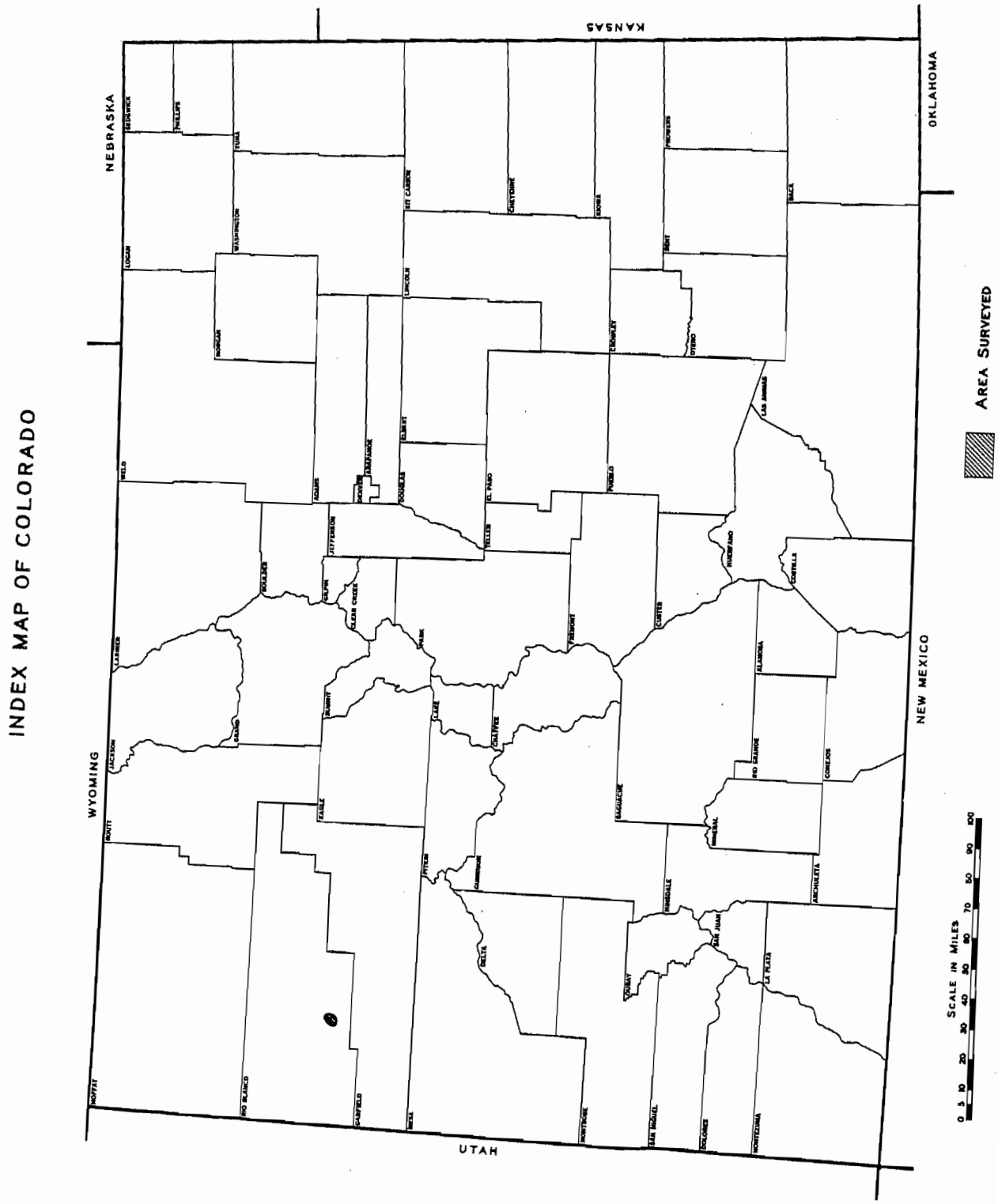
J. G. Jackson

J. G. Jackson, Senior Geophysicist

2441-1

* Trademark of Continental Oil Company

APPENDIX I


INDEX MAP OF COLORADO
NEBRASKA
KANSAS
OKLAHOMA
NEW MEXICO
UTAH
WYOMING
AREA SURVEYED
SCALE IN MILES
0 5 10 20 30 40 50 60 70 80 90 100
SEDGWICK
PHILLIPS
YUMA
WASHINGTON
LOGAN
MORGAN
WELD
LARIMER
JACKSON
MOFFAT
RIO BLANCO
GARFIELD
MESA
MONTROSE
SAN MIGUEL
DOLORES
MONTEZUMA
LA PLATA
ARCHULETA
ADAMS
JEFFERSON
DOUGLAS
ELBERT
LINCOLN
KIT CARSON
CHEYENNE
KIOWA
PROWERS
BENT
BACA
CROWLEY
OTERO
LAS ANIMAS
EL PASO
TELLER
PUEBLO
HUERFANO
COSTILLA
GILPIN
CLEAR CREEK
PARK
FREMONT
CUSTER
ALAMOSA
GRAND
SUMMIT
EAGLE
PITKIN
GUNNISON
SAGUACHE
RIO GRANDE
CONEJOS
MINERAL
OURAY
SAN JUAN
DELTA
MONTROSE
HINSDALE
ARCHULETA

APPENDIX II

PHYSIOGRAPHY

Topography:	Hilly uplands
Population:	Sparsely populated
Culture:	80% pastureland, 20% timber
Drainage:	Intermittent drainage in a northeasterly direction, furnished by Fawn Creek, a tributary to Piceance Creek
Soil:	Brown, clay, sandy, sandy clay
Weather:	Generally fair, mild
Roads:	75% trails, 25% none
Access to area from headquarters:	Via Colorado Highway No. 64 and Colorado Highway No. 13, an average distance of about 35 miles from headquarters
Traverse difficulties:	Rugged terrain, timber. Bulldozer used to clear trails in timber.

APPENDIX III

GEOLOGY

Near-surface formation:	Green River formation of Tertiary age
Subsurface log:	Equity Oil Company No. 1 Government Fawn Creek, SW NW Section 14 T 3 S, R 98 W Rio Blanco County, Colorado
Dry hole	Elevation: 6629 ft. (K.B.) Or. Marker +4523 I. Marker +2344 Top of Cretaceous +549 T.D. 7895 ft.
Major unconformities:	Between Tertiary and Cretaceous
Regional dip:	Approximately northeasterly
Potential producing horizons:	Sands and limes of Tertiary age Sands and limes of Cretaceous age
Type structures expected:	Folded structures: domes, anticlines; fault traps, stratigraphic traps
Well control:	Tied to: Equity Oil No. 1 Government Fawn Creek Equity Oil No. 1 Boies

APPENDIX IV

OPERATION METHODS

Method used:	Continuous profiling, common depth point 400% coverage
Spreads used:	Straddle
Normal length:	5280-0-5280 feet
Distance between shotpoints:	1320 feet
Distance from shothole to close geophone stations:	220 feet
Number of geophone stations adjacent to hole:	2
Geophone station spacing:	220 feet
Geophones used:	HS-J, 14 Hz, .7 damping factor
Number per trace:	18
Connection:	Series
Spacing in group:	12 feet
Arrangement in group:	Straddling station, in line
Instrumentation:	
Type amplifiers:	TI DFS III
Number of channels:	48
Filter settings:	
Monitor and tape:	12 to 124 Hz
Field playback:	12 to 124 Hz
Processed sections:	TVBP 0 to 1.6 = 12-18-35-40 Hz 1.4 to 4.0 = 5-10-25-30 Hz
Type mixing:	None
Type camera:	48 trace

APPENDIX IV (Contd.)

OPERATION METHODS (Contd.)

Shothole data:	
Type drilling:	Rotary with water and air
Special equipment used:	Portable pits, prefabricated hole plugs
Shothole depths:	
Normal:	140 feet
Number of holes used per location:	1
Formations encountered:	Sand, gravel, shale, sandstone
Best shooting depth:	117 feet
Dynamite charges:	
Normal:	75 pounds
Range:	50 to 75 pounds, holes preloaded

Elevation survey:

Based on USGS bench marks. All seismic locations on closed elevation traverses tied within a maximum horizontal error of 200 feet, and a maximum vertical error of 2.3 feet.

Operational difficulties:	Inaccessibility of prospect: had to use bulldozer to open trails in timbered areas.

STATION AND SHOT HOLE ARRANGEMENT

LEGEND

Shot Hole Under Test	◎
Adjoining Shot Hole	○
Station Number	1
Line of Traverse	----
Geophones per Station	18
Geophone Spacing	12'

APPENDIX V

OPERATING STATISTICS

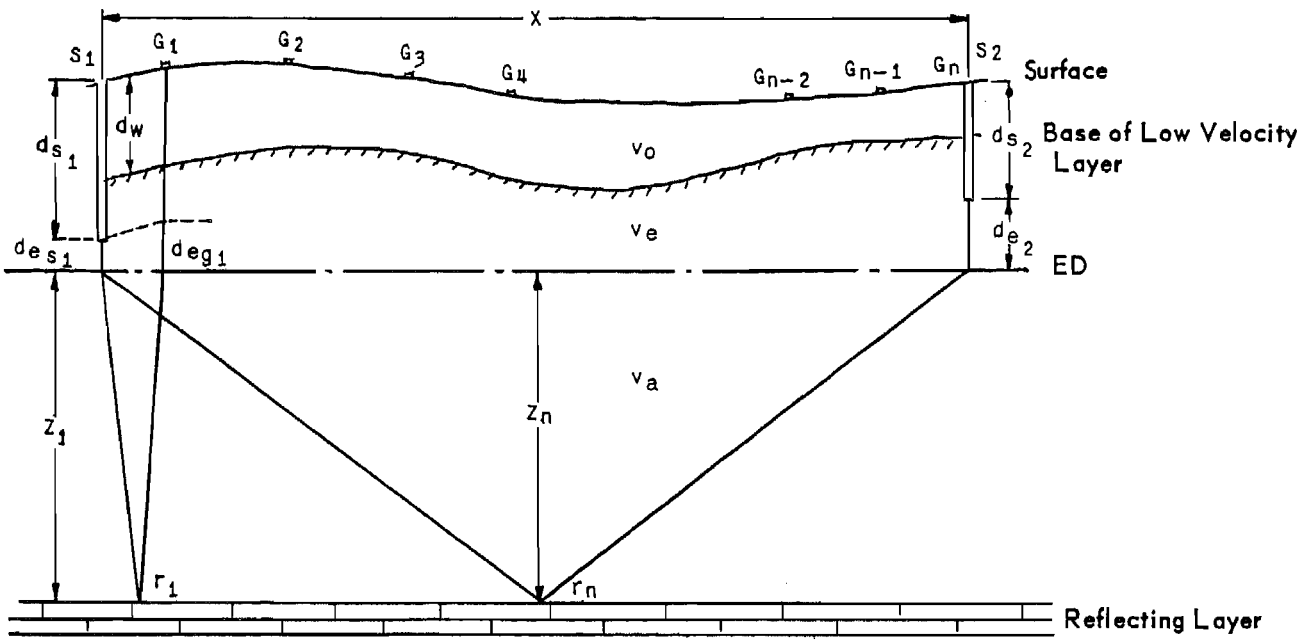
Basic crew:	
Crew headquarters:	Meeker, Colorado
Starting date:	October 11, 1970
Completion date:	October 16, 1970
Number of holes shot:	48
Linear miles covered:	10,958
Dynamite used:	3550 pounds
Type:	Hi-velocity
Number of caps used:	50
Normal length leads:	150 feet
Drilling:	
Number of drills used:	1
Total drill hours:	Drills on footage basis
Number of holes drilled:	48
Total footage drilled:	6720 feet
Average length water hauls:	1/2 to 1 hour
Number of sets bit blades used:	10
Type:	4-3/4 inserted
Mud used:	1250 pounds
Type:	Quick Gel
Bulldozer time:	25.0 hours

APPENDIX VI

CALCULATION AND INTERPRETATION METHODS

Record quality:	Fair to NR, low frequency
Type correction used for final data:	Normal uphole
Other corrections calculated:	Summation
Individual trace corrections used for replay sections:	Summation, adjusted to normal uphole correction
Spread correction:	Used; applied to individual traces on replay sections
Time reference datum:	6900 feet above sea level
Weathering velocity, v_o:	2500 feet per second
Elevation velocity, v_e:	7500 feet per second
Type replay cross sections prepared:	Galvo-area combination
Final data normally obtained from:	400% stacked sections
Horizons mapped:	
Unidentified Tertiary	
Time range:	371 to 677 milliseconds
Depth range:	+5323 to +4022 feet
Velocity, v_a:	8500 E feet per second
Unidentified Cretaceous - Near Dakota	
Time range:	1565 E to 2013 milliseconds
Depth range:	-2490 to -5178 feet
Velocity, v_a:	12,000 E feet per second

DEPTH DETERMINATION FOR CONTINUOUS PROFILING
Using Normal Uphole Corrections



LEGEND

S	=	Shotpoint Location	t_e	=	de/ve
G	=	Geophone Location	t_w	=	dw/vo
X	=	Surface Distance	E_s	=	Elevation of Shotpoint
d_s	=	Depth of Charge	E_g	=	Elevation of Geophone
d_w	=	Thickness of Low Velocity Layer	E_m	=	$\frac{1}{2}(E_s + E_g)$
t_s	=	Uphole Time	E_m'	=	$E_m - d_s = \frac{1}{2}(E_s' + E_g')$
ED	=	Elevation or Reference Datum	E_s'	=	$E_s - d_s$
Z	=	Depth below ED	E_g'	=	$E_g - d_s$
t_r	=	Recorded Reflection Time	de_s	=	$E_s' - ED$
t_c	=	Corrected Reflection Time	de_g	=	$E_g' - ED$
t_x	=	Normal Moveout Correction	t_x	=	$\frac{X^2}{2 v_a^2 t_c}$
v_o	=	Average Velocity in Low Velocity Layer			
v_e	=	Elevation Correction Velocity			
v_a	=	Average Velocity to Reflecting Horizon			

$$t_{c_1} = t_{r_1} - t_{es_1} - t_{eg_1} - t_{s_1}$$

$$= t_{r_1} - 1/v_e(E_m' - ED) - t_{s_1}$$

$$Z_1 = \tfrac{1}{2} v_a t_{c_1}$$

$$t_{c_n} = t_{r_n} - t_{es_1} - t_{eg_n} - t_{s_2}$$

$$Z_n = \tfrac{1}{2} v_a (t_{c_n} - t_{x_n})$$

APPENDIX VII

MATERIAL SUBMITTED SEPARATELY

Base shotpoint tracing
Sepias with data
All records for the survey - monitor and playbacks
Magnetic tapes
Plane table sheets
Surveyor's field notes
Driller's reports
Replay sections:
  Variable area-variable amplitude
  Films from which above sections were taken
Calculation book containing:
  Calculation and interpretation methods
  Time-depth conversion tables
  Weathering graph sheets
  Fiducial correction calculations
  Replay instructions
  Observer's reports
  Shooter's reports