UNITED STATES
DEPARTMENT OF THE INTERIOR
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Technical Letter
Dribble-21

August 14, 1962

Federal Center, Denver 25, Colorado

Mr. James E. Reeves, Manager
Nevada Operations Office
U. S. Atomic Energy Commission
P. O. Box 1676
Las Vegas, Nevada

Dear Mr. Reeves:

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TECHNICAL LETTER: DRIBBLE-21

VELOCITY CROSS SECTION 4, EXTENDING NORTHWEST
FROM TATUM DOME, LAMAR COUNTY, MISS.

By

D. H. Eargle, R. A. Black, B. Davis,
and J. Stanford

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Sincerely yours,

W. S. Twenhofel

W. S. Twenhofel
Program Supervisor
Special Projects Branch

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VELOCITY CROSS SECTION 4, EXTENDING NORTHWEST
FROM TATUM DOME, LAMAR COUNTY, MISS.

By

D. H. Eargle, R. A. Black, B. Davis, and J. Stanford

Velocity cross section 4 extends about 28 miles northwest from Tatum salt dome, south-central Lamar County, Mississippi, to the north-eastern part of Marion County. The line of section crosses Tatum dome and passes just south of Lampton dome. Velocity cross section 4 is the fourth of a series of seven such sections (fig. 1) prepared to show major sonic velocity zones (and lateral variations of sonic velocity within these zones) for a region within a radius of about 25 miles of Tatum salt dome. Tatum dome is the site proposed for a series of seismic experiments for improving the detection of underground nuclear explosions. These experiments have the code name "Dribble" and are a part of the Vela Uniform program of the Atomic Energy Commission.

Data on sonic velocities of the sedimentary rocks surrounding Tatum dome are required for planning of instrumentation for recording the proposed seismic events and in the interpretation of the recorded seismograms. Velocity cross sections 1, 2, and 3 have been published as Technical Letters Dribble-5, Dribble-18, and Dribble-20, respectively. The method used in preparing the velocity cross sections has been described in these three previous Technical Letters.

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A map of the Gulf Coast region of the United States, showing the coastline from Texas to Florida. A small square box is drawn on the Louisiana coast, indicating the location of the study area. The word "MISSISSIPPI" is written above the box, and "LOUISIANA" is written below it.

Location Map

Velocity cross section

JS G S
January 17, 1962
Revised June 6 1962

Velocity cross section 4 (fig. 2) begins with the Humble No. 1 Hibernia well on the southeast flank of Tatum dome and ends with the California No. 1 Reimers well to the northwest. Velocity control was obtained from continuous-velocity logs of these two wells, and velocity zones were traced between these wells by means of electric logs from 8 additional wells along the line of section. Velocity cross section 4 is the only one of the seven velocity sections that crosses Tatum dome. As shown in figure 2 the top of the salt core of Tatum dome is slightly inclined to the southeast, and is not flat, but is somewhat rounded on the southeast side of the dome. The rim syncline is interpreted as its true extent and depth are not known exactly. The rather steep rise from well EL-25 (Gulf No. 3 Bradshaw) to the southeast is the effect of a broad ridge that may be due to the rise of a "salt pillow" from which Tatum and Midway domes project as spines. Well EL-25 is believed to be in the rim syncline of Lampton dome. The apparent lower structural positions of well EL-24 (Deep Rock No. 1 Allen) and EL-23 (Texas Crude No. 1 Rankin) are due to their down-dip positions with respect to adjoining wells.

The Cretaceous formations in figure 2 show greater structural relief than do the overlying Tertiary formations, but show little variation in thickness. The Tertiary formations, on the other hand, vary in thickness and thus tend to obliterate the structural anomalies shown in the Cretaceous formations. The Tertiary formations thicken generally to the northwest, toward the Mississippi embayment, a syncline that parallels the Mississippi River.

The interval-velocity logs of the Humble No. 1 Hibernia and the California No. 1 Reimers wells are shown in figure 3. The numbers beside the velocity zones are the average interval-velocities in feet per second. The upper part of the California No. 1 Reimers well (from approximately -1,700 feet to the top of the log) was logged with a single receiver sonic probe whereas the lower part was logged with a dual receiver probe. The stratigraphic contacts were determined from the electric logs of the various wells, and are the same as the stratigraphic units on Stratigraphic Table 1 in Technical Letter Dribble-4. The deeper of the two wells (the California No. 1 Reimers) bottomed in Pre-Dantzler rocks of Washita and Fredericksburg age, for which unit velocities have previously been reported in Technical Letters Dribble-18 and Dribble-20.

The velocity cross section, utilizing data from the interval-velocity logs, and traced through the other wells by means of electric logs, is shown in figure 4. The high velocity zones are shown on this section, and also on figure 2, by cross-hatching, and the low velocity zones are shown by stippling. The numbers along the wells in which continuous-velocity logs were run indicate the interval-velocity in feet per second.

Although both of the continuous-velocity logs begin in the Pascagoula-Hattiesburg Clay undifferentiated, no velocity zones were found in this sequence that could be correlated along the line of section. In general the sands and clays of this sequence are low in average velocity with the sands, which are loose and incohesive, being

generally of lower velocity than are the clays.

The stratigraphic sequence beginning at the top of the Heterostegina zone of the Catahoula Sandstone and ending at the top of the Wilcox Group is composed of a sequence of limestones of relatively high sonic velocity separated by clays and sands of relatively low sonic velocity. On this cross section the velocities of the prominent limestone units in this sequence, with the exception of the Cook Mountain Formation, decrease towards the northwest. The unit comprising the Wilcox Group and the upper part of the Midway Group has many distinct velocity zones, but in general these zones could not be correlated from well to well along velocity section 4. The Salt Mountain Limestone, near the base of the Wilcox Group, could not be definitely traced along the line of section as it apparently gives way in a westerly direction to sand and shale. There is a thin zone of higher than average velocity at about the -5350 elevation in the California No. 1 Reimers well that could possibly be the Salt Mountain Limestone, although it appears to be higher stratigraphically than the Salt Mountain. The stratigraphic contact between the Wilcox-Upper Midway and the Porters Creek Clay is not marked by a velocity discontinuity that can be correlated from well to well.

The chalk sequence shows a generally high sonic velocity with velocity zones within the chalk sequence that are similar to velocity zones noted in the chalk sequences on velocity cross sections 1, 2, and 3. These velocity zones, however, cannot be correlated on the electric logs. The base of the chalk is readily identified by the top of the low velocity zone that correlates with the McShan Formation.

The Gordo Formation and the upper part of the Coker Formation form distinct velocity zones and the top of the lower Tuscaloosa is marked by a velocity discontinuity. The Pre-Dantzler rocks of Washita and Fredericksburg age show considerably higher velocities than do the rocks of the overlying Dantzler Formation.

The name and location of each well used in velocity cross section 4, and other pertinent data for each well, are given on table 1.

Table 1.--Well data for Cross Section 4

Explanation of Data	
Well Number:	Well Name (company, well number, lease name)
	Location: section, township, range, location in section
	County
	Elevation Datum: KB-Kelly bushing, DF-derrick floor, in feet above sea level
	Total Depth of Well: TD, in feet below elevation datum
<hr/>	
CVL-10:	The California Co. No. 1 F. W. Reimers
	Location: sec. 23, T. 4 N., R. 12 E.; 1980' from N. line, 1830' from E. line of sec.
	Marion County
	KB 389 TD 13,067
EL-22:	American Liberty Oil Co. et al. No. 1 Beard
	Location: sec. 20, T. 4 N., R. 13 E.; 1680' W, 1720' N. of SE cor. sec.
	Marion County
	KB 180 TD 10,302
EL-23:	Texas Crude Oil Co. et al. No. 1 Rankin Co.
	Location: sec. 9, T. 3 N., R. 13 E.; 660' N. & E. of SW cor.
	Marion County
	KB 346 TD 10,492
EL-24:	Deep Rock Oil Corp. No. 1 John Allen
	Location: sec. 14, T. 3 N., R. 13 E.; center SE $\frac{1}{4}$ SE $\frac{1}{4}$
	Marion County
	KB 150 TD 10,523
EL-28:	Parker Drilling Co. No. 1 A. Simmons
	Location: sec. 35, T. 4 N., R. 18 W.; 732' N., 827' E. of SW cor. SW $\frac{1}{4}$ SE $\frac{1}{4}$
	Marion County
	KB 296 TD 10,007
EL-25:	Gulf Refining Co. No. 3 Bradshaw
	Location: sec. 29, T. 3 N., R. 17 W., 660' S. & W. of NE cor. SE $\frac{1}{4}$ NW $\frac{1}{4}$
	Marion County
	KB 234 TD 9,624

- EL-26: Lyle Cashion Co. No. 1 E. H. Bradshaw
 Location: sec. 36, T. 3 N., R. 17 W.; 330' N., 372' W. of
 SE cor. of NE $\frac{1}{4}$ NE $\frac{1}{4}$
 Marion County
 KB 334 TD 9,508
- EL-27: Riverside Oil Co. No. 1 L. C. Saucier
 Location: sec. 7, T. 2 N., R. 16 W.; 382' S., 514' E.
 of NW cor. NE $\frac{1}{4}$ NE $\frac{1}{4}$
 Lamar County
 KB 208 TD 12,024
- EL-21: Viking Oil Co. et al No. A-1 Hibernia Bank
 Location: sec. 9, T. 2 N., R. 16 W.; 660' N., 611' W. of
 SE cor. SW $\frac{1}{4}$ SW $\frac{1}{4}$
 Lamar County
 KB 306 TD 12,210
- CVL-7: Humble Oil & Refining Co. No. 1 Hibernia Bank & Trust Co.
 Location: sec. 13, T. 2 N., R. 16 W., 1646.2' N., 2307' W.
 of SE cor. sec.
 Lamar County
 KB 345 TD 6013

FIGURE 2.— CROSS SECTION 4, SHOWING CORRELATION OF STRATA BY MEANS OF ELECTRICAL AND CONTINUOUS-VELOCITY LOGS

CALIFORNIA
No. 1 REIMERS
CVL-10

HUMBLE
No. 1 HIBERNIA
CVL-7

FIGURE 3.—INTERVAL-VELOCITY LOGS FOR THE TWO WELLS ALONG CROSS SECTION 4 FOR WHICH CONTINUOUS-VELOCITY LOGS ARE AVAILABLE

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FIGURE 4-VELOCITY CROSS SECTION 4