

TO: Scott  
TO: Mark  
From: Kirby  
Sur: E-15-17-34e 660h/4 980/w

**PHOENIX DRILLING SERVICES**  
HORIZONTAL SURVEY PROGRAM  
MINIMUM CURVATURE CALCULATIONS(SPE-3362)

|                                            |                                                                                                                   |                                  |
|--------------------------------------------|-------------------------------------------------------------------------------------------------------------------|----------------------------------|
| OPERATOR: <b>TEXACO E &amp; P, INC.</b>    | START: <b>8/20/97</b>                                                                                             | FILE: <b>CURVE1.V</b>            |
| WELL: <b>NORTH VACUUM ABO UNIT # 31</b>    | FINISH: <b>9/1/97</b>                                                                                             |                                  |
| LOCATION: <b>LEA COUNTY, NEW MEXICO</b>    | INFORMATION PROVIDED BY: <b>TEXACO E</b>                                                                          |                                  |
| JOB NO: <b>173166</b>                      | HORIZONTAL COORDINATOR: <b>RUBESH, I</b>                                                                          |                                  |
| DIP1 = <b>7.35</b> deg = <b>97.35</b> deg  | DATE: <b>9/1/97</b>                                                                                               | MAG DECLINATION <b>9.11 EAST</b> |
| TARGET1 = <b>8,768</b> ft TVD              | TIME: <b>11:57 AM</b><br><b>30-025-33988</b><br>DIRECTION <b>224.80</b><br>BHL: <b>E-15-17-34; 2080/h/4 557/w</b> |                                  |
| VS1 = <b>1,317</b> ft                      |                                                                                                                   |                                  |
| DIP2 = <b>-9.85</b> deg = <b>80.15</b> deg |                                                                                                                   |                                  |
| TARGET2 = <b>8,771</b> ft TVD              |                                                                                                                   |                                  |
| VS2 = <b>1,431</b> ft                      |                                                                                                                   |                                  |

| SVY # | MEASURED DEPTH | INCL (DRIFT) | TRUE          |                |                  | DLS/ 100 | CENTER            |                  |                   |                 |
|-------|----------------|--------------|---------------|----------------|------------------|----------|-------------------|------------------|-------------------|-----------------|
|       |                |              | AZIMUTH (DIR) | VERTICAL DEPTH | VERTICAL SECTION |          | ABOVE(+) BELOW(-) | RIGHT(+) LEFT(-) | NORTH(+) SOUTH(-) | EAST(+) WEST(-) |
| TIE   | 8545.4         | 1.1          | 103.9         | 8544.5         | -48.9            | 0.1      | 400.0             | -04.6            | -32.1             | 101.7           |
| 1     | 8617           | 2.2          | 294.7         | 8616.0         | -48.7            | 4.5      | 328.4             | -94.1            | -31.7             | 101.1           |
| 2     | 8632           | 9.3          | 294.8         | 8631.0         | -48.2            | 47.3     | 313.4             | -92.7            | -31.1             | 99.7            |
| 3     | 8647           | 18.0         | 279.4         | 8645.5         | -46.5            | 62.4     | 298.6             | -89.6            | -30.2             | 96.3            |
| 4     | 8662           | 24.4         | 265.0         | 8659.5         | -42.8            | 54.7     | 284.1             | -85.7            | -30.1             | 91.0            |
| 5     | 8677           | 30.3         | 253.4         | 8672.8         | -37.1            | 52.8     | 270.1             | -81.9            | -31.4             | 84.2            |
| 6     | 8692           | 37.5         | 257.0         | 8685.3         | -29.9            | 49.8     | 256.7             | -77.7            | -33.5             | 76.2            |
| 7     | 8707           | 45.5         | 254.5         | 8696.5         | -21.3            | 54.5     | 244.4             | -72.6            | -36.0             | 66.5            |
| 8     | 8722           | 50.9         | 247.2         | 8706.5         | -11.3            | 51.1     | 233.1             | -67.7            | -39.7             | 56.0            |
| 9     | 8746           | 61.7         | 242.2         | 8719.8         | 7.5              | 48.2     | 217.3             | -61.0            | -48.2             | 38.0            |
| 10    | 8778           | 70.7         | 241.0         | 8732.7         | 35.5             | 28.3     | 200.8             | -52.5            | -62.2             | 12.3            |
| 11    | 8809           | 74.9         | 236.8         | 8741.9         | 64.2             | 18.7     | 188.0             | -45.3            | -77.5             | -13.1           |
| 12    | 8841           | 75.0         | 235.3         | 8750.2         | 94.5             | 4.5      | 175.7             | -39.3            | -94.7             | -38.7           |
| 13    | 8866           | 75.7         | 231.4         | 8756.5         | 118.4            | 15.4     | 166.3             | -35.7            | -109.2            | -58.1           |
| 14    | 8898           | 77.9         | 230.9         | 8763.8         | 149.4            | 7.0      | 155.0             | -32.3            | -128.7            | -82.4           |
| 15    | 8929           | 80.1         | 230.5         | 8769.7         | 179.6            | 7.2      | 145.2             | -29.1            | -148.0            | -105.9          |
| 16    | 8992           | 83.5         | 229.1         | 8778.7         | 241.7            | 5.8      | 128.2             | -23.7            | -188.2            | -153.5          |
| 17    | 9024           | 82.6         | 229.3         | 8782.6         | 273.4            | 2.9      | 120.3             | -21.3            | -209.0            | -177.6          |
| 18    | 9056           | 82.0         | 228.1         | 8786.9         | 305.0            | 4.2      | 111.9             | -19.1            | -229.9            | -201.4          |
| 19    | 9086           | 81.7         | 228.9         | 8791.1         | 334.7            | 2.8      | 103.8             | -17.2            | -249.6            | -223.6          |
| 20    | 9117           | 81.2         | 228.8         | 8795.7         | 365.3            | 1.6      | 95.3              | -15.0            | -269.8            | -246.7          |
| 21    | 9149           | 81.1         | 227.9         | 8800.7         | 396.8            | 2.8      | 86.3              | -13.1            | -290.8            | -270.3          |
| 22    | 9181           | 80.6         | 227.3         | 8805.8         | 428.4            | 2.4      | 77.1              | -11.5            | -312.1            | -293.7          |
| 23    | 9212           | 80.4         | 227.7         | 8810.9         | 458.9            | 1.4      | 68.0              | -10.1            | -332.7            | -316.2          |
| 24    | 9243           | 79.9         | 228.0         | 8816.2         | 489.4            | 1.9      | 58.8              | -8.5             | -353.2            | -338.9          |
| 25    | 9275           | 80.0         | 225.9         | 8821.8         | 520.9            | 6.5      | 49.2              | -7.3             | -374.7            | -361.9          |
| 26    | 9307           | 82.3         | 224.9         | 8826.7         | 552.5            | 7.8      | 40.2              | -6.9             | -396.9            | -384.4          |
| 27    | 9339           | 82.0         | 225.3         | 8831.1         | 584.2            | 1.6      | 31.7              | -6.8             | -419.3            | -406.8          |
| 28    | 9371           | 81.4         | 224.4         | 8835.7         | 615.9            | 3.4      | 23.0              | -6.7             | -441.8            | -429.2          |
| 29    | 9403           | 86.1         | 224.5         | 8839.2         | 647.7            | 14.7     | 15.4              | -6.9             | -464.5            | -451.4          |
| 30    | 9434           | 88.4         | 226.2         | 8840.6         | 678.6            | 9.2      | 9.9               | -6.6             | -486.2            | -473.5          |
| 31    | 9466           | 88.3         | 225.5         | 8841.6         | 710.6            | 2.2      | 4.9               | -6.1             | -508.5            | -496.4          |
| 32    | 9498           | 91.3         | 225.8         | 8841.7         | 742.6            | 9.4      | 0.6               | -5.6             | -530.9            | -519.3          |
| 33    | 9529           | 96.8         | 226.2         | 8839.5         | 773.5            | 17.8     | -1.2              | -4.9             | -552.3            | -541.5          |
| 34    | 9561           | 99.5         | 227.5         | 8835.0         | 805.2            | 9.3      | -0.7              | -3.8             | -574.0            | -564.6          |
| 35    | 9591           | 99.7         | 227.6         | 8830.0         | 834.7            | 0.7      | 0.5               | -2.4             | -594.0            | -586.5          |