



## Energen Resources

Rio Arriba County, NM

S-14, T-32N, R-5W (Navajo Lake #100)

Navajo Lake #100

Motherbore

30.039-29707

Surface 760/W 2540/E Sec 24  
BHL 885/S 1907/E sec 13  
4200md  
3388 TVd

RCVD NOV 7 '07

OIL CONS. DIV.

DIST. 3

Survey: Survey #1

## PathFinder X and Y Report

29 August, 2007

**PATHFINDER**  
ENERGY SERVICES

11/13/07

Ground Elevation: 6652.0  
RKB Elevation: 12' RKB Applied @ 5664.0ft (AWS# 289)  
Rig Name: AWS# 289

+N/-S 0.0 +E/-W 0.0 Northing 2174917.02 Easting 1302026.02 Latitude 36° 50' 16.795 N Longitude 107° 24' 30.248 W Slot

### SECTION DETAILS

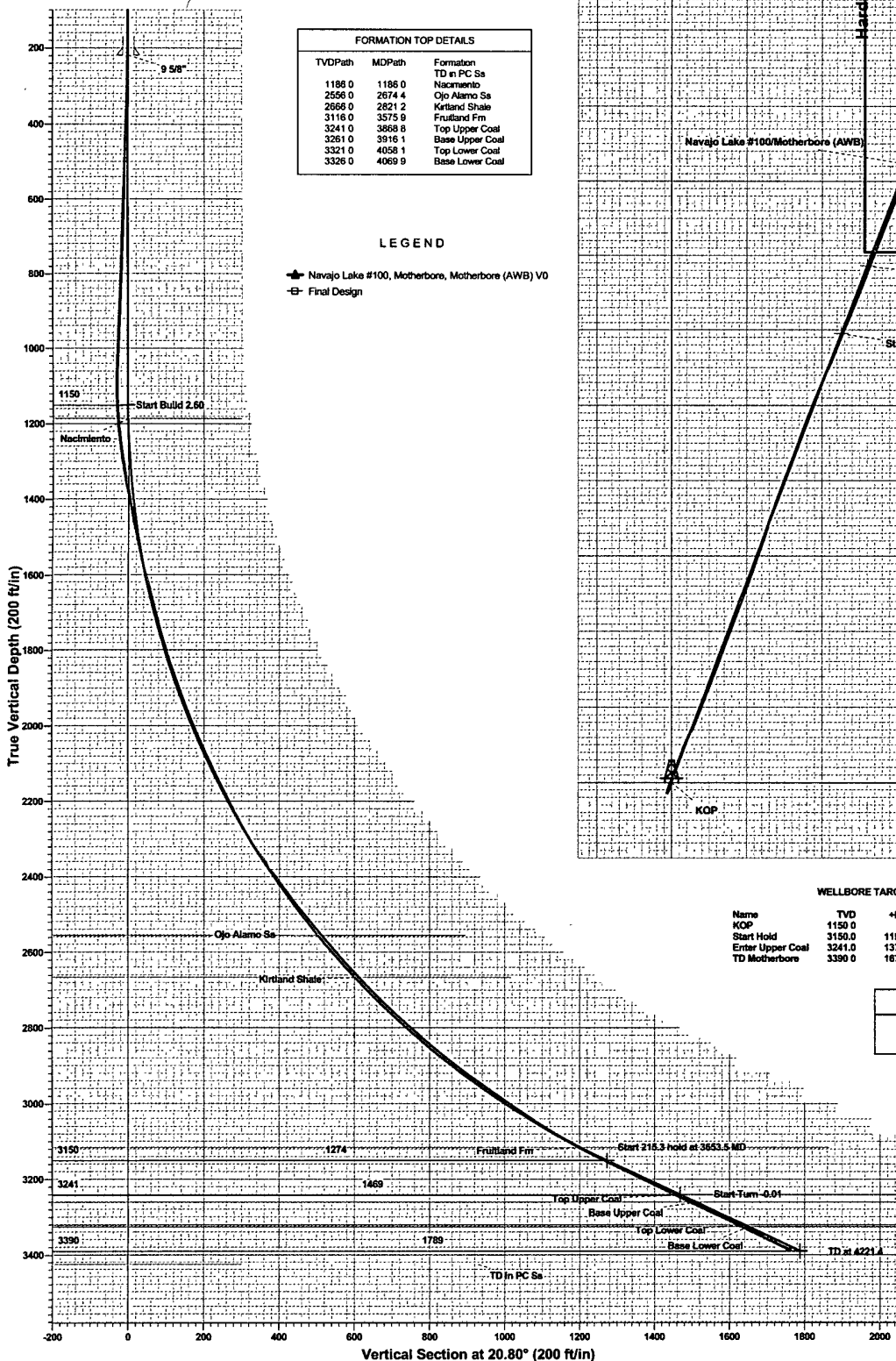
| Sec | MD     | Inc   | Azi   | TVD    | +N/-S  | +E/-W | DLag  | TFace | VSec   | Target |
|-----|--------|-------|-------|--------|--------|-------|-------|-------|--------|--------|
| 1   | 0.0    | 0.00  | 0.00  | 0.0    | 0.0    | 0.0   | 0.00  | 0.00  | 0.0    |        |
| 2   | 1150.0 | 0.00  | 0.00  | 1150.0 | 0.0    | 0.0   | 0.00  | 0.00  | 0.0    |        |
| 3   | 3653.5 | 65.00 | 20.80 | 3150.0 | 1191.1 | 452.5 | 2.60  | 20.80 | 1274.1 |        |
| 4   | 3868.8 | 65.00 | 20.80 | 3241.0 | 1373.5 | 521.8 | 0.00  | 0.00  | 1469.3 |        |
| 5   | 4221.4 | 65.00 | 20.77 | 3390.0 | 1672.3 | 635.1 | -0.01 | -0.01 | 1788.8 |        |

### FORMATION TOP DETAILS

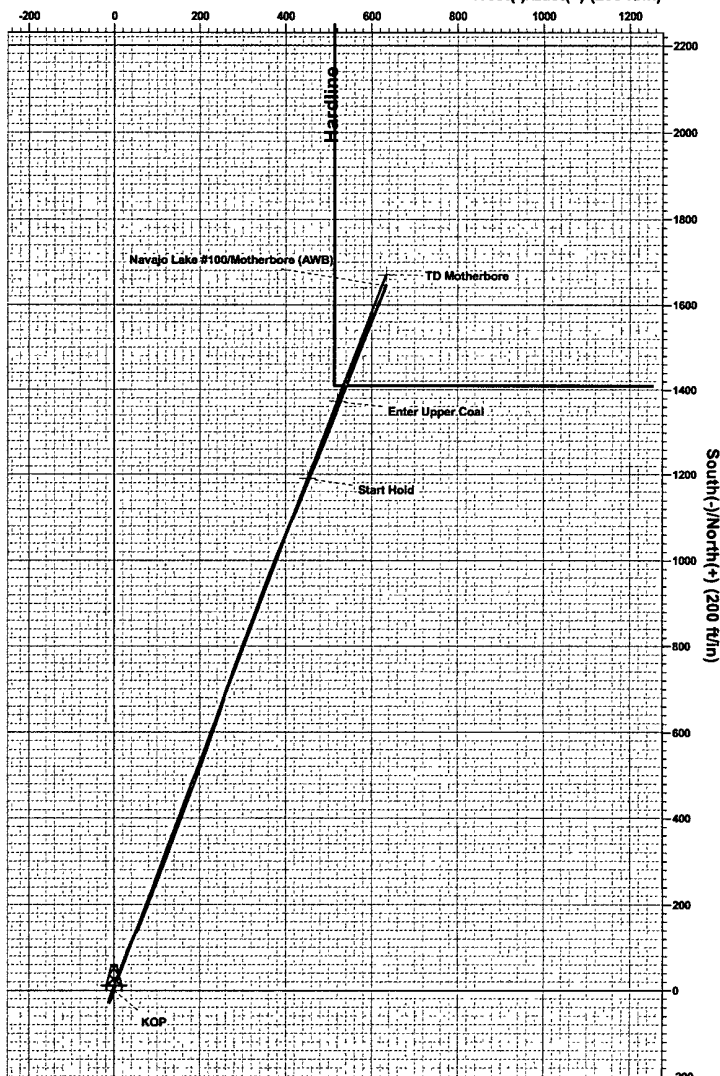
| TVDPath | MDPath | Formation       |
|---------|--------|-----------------|
| 1150.0  | 1150.0 | Nacminto        |
| 2556.0  | 2674.4 | Ojo Alamo Sa    |
| 2656.0  | 2821.2 | Kirtland Shale  |
| 3116.0  | 3575.9 | Frutland Fm     |
| 3241.0  | 3868.8 | Top Upper Coal  |
| 3261.0  | 3916.1 | Base Upper Coal |
| 3321.0  | 4058.1 | Top Lower Coal  |
| 3326.0  | 4069.9 | Base Lower Coal |

### LEGEND

- Navajo Lake #100, Motherbore, Motherbore (AWB) V0
- Final Design



West(-)/East(+) (200 ft/in)



### WELLBORE TARGET DETAILS (MAP CO-ORDINATES)

| Name             | TVD    | +N/-S  | +E/-W | Northing   | Easting    | Shape |
|------------------|--------|--------|-------|------------|------------|-------|
| KOP              | 1150.0 | 0.0    | 0.0   | 2174917.02 | 1302026.02 | Point |
| Start Hold       | 3150.0 | 1191.1 | 452.5 | 2176102.53 | 1302492.97 | Point |
| Enter Upper Coal | 3241.0 | 1373.5 | 521.8 | 2176284.07 | 1302564.49 | Point |
| TD Motherbore    | 3390.0 | 1672.3 | 635.1 | 2176581.47 | 1302681.41 | Point |

### Note.

All Hardlines are estimates only and are subject to customers approval.



Azimuths to True North  
Magnetic North: 10.23°

Magnetic Field  
Strength: 51315.5nT  
Dip Angle: 63.83°  
Date: 8/15/2007  
Model: IGRF200510

PROJECT DETAILS: Rio Arriba County, NM  
Geodetic System: US State Plane 1983  
Datum: North American Datum 1983  
Ellipsoid: GR5 1980  
Zone: New Mexico Central Zone

System Datum: Mean Sea Level  
Local North: No north reference data is available

Plan: Final Design (Navajo Lake #100/Motherbore)

Created By: Matthew May Date: 13 31, August 29 2007

Checked: \_\_\_\_\_ Date: \_\_\_\_\_



## PathFinder X and Y Report

**PATHFINDER**  
ENERGY SERVICES

**Company:** Energen Resources  
**Project:** Rio Arriba County, NM  
**Site:** S-14, T-32N, R-5W (Navajo Lake #100)  
**Well:** Navajo Lake #100  
**Wellbore:** Motherbore  
**Design:** Motherbore (AWB)

**Local Co-ordinate Reference:** Well Navajo Lake #100  
**TVD Reference:** 12' RKB Applied @ 6664.0ft (AWS# 289)  
**MD Reference:** 12' RKB Applied @ 6664.0ft (AWS# 289)  
**North Reference:** True  
**Survey Calculation Method:** Minimum Curvature  
**Database:** 2003.16nwdb

**Project** Rio Arriba County, NM

**Map System:** US State Plane 1983  
**Geo Datum:** North American Datum 1983  
**Map Zone:** New Mexico Central Zone

**System Datum:** Mean Sea Level

**Site** S-14, T-32N, R-5W (Navajo Lake #100)

|                              |          |                     |                 |                          |                   |
|------------------------------|----------|---------------------|-----------------|--------------------------|-------------------|
| <b>Site Position:</b>        |          | <b>Northing:</b>    | 2,174,917.02 ft | <b>Latitude:</b>         | 36° 58' 16.795 N  |
| <b>From:</b>                 | Lat/Long | <b>Easting:</b>     | 1,302,026.02 ft | <b>Longitude:</b>        | 107° 24' 30.248 W |
| <b>Position Uncertainty:</b> | 0.0 ft   | <b>Slot Radius:</b> | "               | <b>Grid Convergence:</b> | -0.70 °           |

**Well** Navajo Lake #100

|                             |             |        |                            |                 |                      |                   |
|-----------------------------|-------------|--------|----------------------------|-----------------|----------------------|-------------------|
| <b>Well Position</b>        | <b>+N-S</b> | 0.0 ft | <b>Northing:</b>           | 2,174,917.02 ft | <b>Latitude:</b>     | 36° 58' 16.795 N  |
|                             | <b>+E-W</b> | 0.0 ft | <b>Easting:</b>            | 1,302,026.02 ft | <b>Longitude:</b>    | 107° 24' 30.248 W |
| <b>Position Uncertainty</b> |             | 0.0 ft | <b>Wellhead Elevation:</b> | ft              | <b>Ground Level:</b> | 6,652.0 ft        |

**Wellbore** Motherbore

| <b>Magnetics</b> | <b>Model Name</b> | <b>Sample Date</b> | <b>Declination</b><br>(°) | <b>Dip Angle</b><br>(°) | <b>Field Strength</b><br>(nT) |
|------------------|-------------------|--------------------|---------------------------|-------------------------|-------------------------------|
|                  | IGRF200510        | 8/15/2007          | 10.23                     | 63.83                   | 51,316                        |

**Design** Motherbore (AWB)

**Audit Notes:**

**Version:** 1.0      **Phase:** ACTUAL      **Tie On Depth:** 0.0

| <b>Vertical Section:</b> | <b>Depth From (TVD)</b><br>(ft) | <b>+N-S</b><br>(ft) | <b>+E-W</b><br>(ft) | <b>Direction</b><br>(°) |
|--------------------------|---------------------------------|---------------------|---------------------|-------------------------|
|                          | 0.0                             | 0.0                 | 0.0                 | 20.80                   |

**Survey Program** Date 8/29/2007

| <b>From</b><br>(ft) | <b>To</b><br>(ft) | <b>Survey (Wellbore)</b> | <b>Tool Name</b> | <b>Description</b> |
|---------------------|-------------------|--------------------------|------------------|--------------------|
| 480.0               | 4,200.0           | Survey #1 (Motherbore)   | Pathfinder       | Pathfinder MWD     |



## PathFinder X and Y Report

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**Design:** Motherbore (AWB)

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**MD Reference:** 12' RKB Applied @ 6664.0ft (AWS# 289)  
**North Reference:** True  
**Survey Calculation Method:** Minimum Curvature  
**Database:** 2003.16nwdb

## Survey

| MD<br>(ft) | Inc<br>(°) | Azi<br>(°) | TVD<br>(ft) | TVDSS<br>(ft) | N/S<br>(ft) | E/W<br>(ft) | DLeg<br>(°/100ft) | V. Sec<br>(ft) | Northing<br>(ft) | Easting<br>(ft) |
|------------|------------|------------|-------------|---------------|-------------|-------------|-------------------|----------------|------------------|-----------------|
| 0.0        | 0.00       | 0.00       | 0.0         | -6,664.0      | 0.0         | 0.0         | 0.00              | 0.0            | 2,174,917.02     | 1,302,026.02    |
| 480.0      | 1.93       | 196.56     | 479.9       | -6,184.1      | -7.7        | -2.3        | 0.40              | -8.1           | 2,174,909.30     | 1,302,023.62    |
| 795.0      | 2.20       | 204.29     | 794.7       | -5,869.3      | -18.3       | -6.3        | 0.12              | -19.4          | 2,174,898.75     | 1,302,019.50    |
| 1,040.0    | 2.20       | 210.88     | 1,039.5     | -5,624.5      | -26.7       | -10.7       | 0.10              | -28.7          | 2,174,890.49     | 1,302,015.05    |
| 1,070.0    | 1.41       | 218.44     | 1,069.5     | -5,594.5      | -27.4       | -11.2       | 2.74              | -29.6          | 2,174,889.71     | 1,302,014.51    |
| 1,100.0    | 0.62       | 269.33     | 1,099.5     | -5,564.5      | -27.7       | -11.6       | 3.76              | -30.0          | 2,174,889.42     | 1,302,014.12    |
| 1,130.0    | 1.32       | 352.91     | 1,129.5     | -5,534.5      | -27.4       | -11.8       | 4.65              | -29.8          | 2,174,889.77     | 1,302,013.92    |
| 1,151.5    | 2.34       | 4.27       | 1,151.0     | -5,513.0      | -26.7       | -11.8       | 5.03              | -29.2          | 2,174,890.45     | 1,302,013.93    |
| <b>KOP</b> |            |            |             |               |             |             |                   |                |                  |                 |
| 1,161.0    | 2.81       | 6.62       | 1,160.5     | -5,503.5      | -26.3       | -11.7       | 5.03              | -28.7          | 2,174,890.88     | 1,302,013.97    |
| 1,191.0    | 4.31       | 11.81      | 1,190.4     | -5,473.6      | -24.5       | -11.4       | 5.11              | -26.9          | 2,174,892.71     | 1,302,014.31    |
| 1,222.0    | 5.54       | 15.15      | 1,221.3     | -5,442.7      | -21.9       | -10.8       | 4.07              | -24.3          | 2,174,895.28     | 1,302,014.97    |
| 1,252.0    | 6.77       | 17.35      | 1,251.1     | -5,412.9      | -18.8       | -9.9        | 4.17              | -21.1          | 2,174,898.36     | 1,302,015.91    |
| 1,283.0    | 7.83       | 18.75      | 1,281.9     | -5,382.1      | -15.0       | -8.7        | 3.47              | -17.1          | 2,174,902.09     | 1,302,017.18    |
| 1,312.0    | 8.97       | 19.81      | 1,310.6     | -5,353.4      | -11.0       | -7.3        | 3.97              | -12.9          | 2,174,906.07     | 1,302,018.63    |
| 1,343.0    | 10.20      | 20.25      | 1,341.1     | -5,322.9      | -6.2        | -5.5        | 3.97              | -7.7           | 2,174,910.89     | 1,302,020.46    |
| 1,373.0    | 10.64      | 20.86      | 1,370.6     | -5,293.4      | -1.1        | -3.6        | 1.51              | -2.3           | 2,174,915.95     | 1,302,022.43    |
| 1,403.0    | 11.08      | 21.13      | 1,400.1     | -5,263.9      | 4.2         | -1.6        | 1.48              | 3.3            | 2,174,921.20     | 1,302,024.52    |
| 1,433.0    | 11.17      | 21.04      | 1,429.5     | -5,234.5      | 9.6         | 0.5         | 0.31              | 9.1            | 2,174,926.58     | 1,302,026.67    |
| 1,462.0    | 11.61      | 21.83      | 1,458.0     | -5,206.0      | 14.9        | 2.6         | 1.61              | 14.9           | 2,174,931.88     | 1,302,028.82    |
| 1,493.0    | 11.96      | 21.13      | 1,488.3     | -5,175.7      | 20.8        | 4.9         | 1.22              | 21.2           | 2,174,937.74     | 1,302,031.21    |
| 1,523.0    | 12.31      | 20.25      | 1,517.6     | -5,146.4      | 26.7        | 7.2         | 1.32              | 27.5           | 2,174,943.62     | 1,302,033.51    |
| 1,553.0    | 12.66      | 20.42      | 1,546.9     | -5,117.1      | 32.8        | 9.4         | 1.17              | 34.0           | 2,174,949.67     | 1,302,035.84    |
| 1,583.0    | 12.84      | 20.95      | 1,576.2     | -5,087.8      | 39.0        | 11.8        | 0.72              | 40.6           | 2,174,955.83     | 1,302,038.25    |
| 1,614.0    | 13.37      | 20.60      | 1,606.4     | -5,057.6      | 45.5        | 14.3        | 1.73              | 47.6           | 2,174,962.38     | 1,302,040.83    |
| 1,644.0    | 13.72      | 20.51      | 1,635.6     | -5,028.4      | 52.1        | 16.7        | 1.17              | 54.7           | 2,174,968.92     | 1,302,043.37    |
| 1,674.0    | 14.16      | 21.04      | 1,664.7     | -4,999.3      | 58.9        | 19.3        | 1.53              | 61.9           | 2,174,975.65     | 1,302,046.02    |



## PathFinder X and Y Report



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Wellbore: Motherbore  
Design: Motherbore (AWB)

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North Reference: True  
Survey Calculation Method: Minimum Curvature  
Database: 2003.16nwdb

## Survey

| MD<br>(ft) | Inc<br>(°) | Azi<br>(°) | TVD<br>(ft) | TVDSS<br>(ft) | N/S<br>(ft) | E/W<br>(ft) | DLeg<br>(°/100ft) | V. Sec<br>(ft) | Northing<br>(ft) | Easting<br>(ft) |
|------------|------------|------------|-------------|---------------|-------------|-------------|-------------------|----------------|------------------|-----------------|
| 1,704.0    | 14.60      | 20.60      | 1,693.7     | -4,970.3      | 65.8        | 21.9        | 1.51              | 69.3           | 2,174,982.58     | 1,302,048.75    |
| 1,735.0    | 15.21      | 20.25      | 1,723.7     | -4,940.3      | 73.3        | 24.7        | 1.99              | 77.3           | 2,174,990.02     | 1,302,051.62    |
| 1,764.0    | 15.39      | 19.90      | 1,751.7     | -4,912.3      | 80.5        | 27.3        | 0.70              | 85.0           | 2,174,997.17     | 1,302,054.34    |
| 1,793.0    | 16.00      | 20.69      | 1,779.6     | -4,884.4      | 87.8        | 30.1        | 2.23              | 92.8           | 2,175,004.50     | 1,302,057.15    |
| 1,824.0    | 17.24      | 21.92      | 1,809.3     | -4,854.7      | 96.1        | 33.3        | 4.16              | 101.7          | 2,175,012.72     | 1,302,060.47    |
| 1,854.0    | 18.64      | 23.50      | 1,837.8     | -4,826.2      | 104.6       | 36.9        | 4.94              | 110.9          | 2,175,021.19     | 1,302,064.15    |
| 1,885.0    | 19.70      | 25.78      | 1,867.1     | -4,796.9      | 113.9       | 41.1        | 4.19              | 121.1          | 2,175,030.39     | 1,302,068.51    |
| 1,915.0    | 20.14      | 26.14      | 1,895.3     | -4,768.7      | 123.1       | 45.6        | 1.52              | 131.2          | 2,175,039.53     | 1,302,073.10    |
| 1,946.0    | 20.49      | 24.47      | 1,924.4     | -4,739.6      | 132.8       | 50.2        | 2.18              | 142.0          | 2,175,049.20     | 1,302,077.81    |
| 1,976.0    | 21.28      | 23.68      | 1,952.4     | -4,711.6      | 142.6       | 54.5        | 2.80              | 152.6          | 2,175,058.91     | 1,302,082.29    |
| 2,007.0    | 21.98      | 22.71      | 1,981.2     | -4,682.8      | 153.1       | 59.0        | 2.54              | 164.1          | 2,175,069.36     | 1,302,086.92    |
| 2,037.0    | 22.86      | 22.44      | 2,009.0     | -4,655.0      | 163.6       | 63.4        | 2.95              | 175.5          | 2,175,079.87     | 1,302,091.44    |
| 2,068.0    | 23.74      | 21.74      | 2,037.4     | -4,626.6      | 175.0       | 68.0        | 2.98              | 187.8          | 2,175,091.17     | 1,302,096.19    |
| 2,098.0    | 24.45      | 21.21      | 2,064.8     | -4,599.2      | 186.4       | 72.5        | 2.47              | 200.0          | 2,175,102.52     | 1,302,100.81    |
| 2,128.0    | 25.15      | 21.48      | 2,092.1     | -4,571.9      | 198.1       | 77.1        | 2.36              | 212.6          | 2,175,114.18     | 1,302,105.53    |
| 2,158.0    | 25.76      | 21.74      | 2,119.1     | -4,544.9      | 210.1       | 81.9        | 2.07              | 225.5          | 2,175,126.11     | 1,302,110.42    |
| 2,190.0    | 26.38      | 22.01      | 2,147.9     | -4,516.1      | 223.1       | 87.1        | 1.97              | 239.5          | 2,175,139.09     | 1,302,115.82    |
| 2,221.0    | 27.00      | 22.18      | 2,175.6     | -4,488.4      | 236.0       | 92.3        | 2.02              | 253.5          | 2,175,151.93     | 1,302,121.22    |
| 2,253.0    | 27.87      | 21.83      | 2,204.0     | -4,460.0      | 249.7       | 97.9        | 2.77              | 268.2          | 2,175,165.53     | 1,302,126.91    |
| 2,284.0    | 28.67      | 21.48      | 2,231.3     | -4,432.7      | 263.4       | 103.3       | 2.64              | 282.9          | 2,175,179.11     | 1,302,132.49    |
| 2,315.0    | 29.63      | 21.21      | 2,258.4     | -4,405.6      | 277.4       | 108.8       | 3.13              | 298.0          | 2,175,193.11     | 1,302,138.16    |
| 2,347.0    | 30.95      | 21.21      | 2,286.0     | -4,378.0      | 292.5       | 114.6       | 4.12              | 314.1          | 2,175,208.08     | 1,302,144.18    |
| 2,378.0    | 32.10      | 21.21      | 2,312.4     | -4,351.6      | 307.6       | 120.5       | 3.71              | 330.3          | 2,175,223.12     | 1,302,150.22    |
| 2,410.0    | 32.89      | 20.86      | 2,339.4     | -4,324.6      | 323.6       | 126.6       | 2.54              | 347.5          | 2,175,239.09     | 1,302,156.59    |
| 2,441.0    | 33.85      | 20.51      | 2,365.3     | -4,298.7      | 339.6       | 132.7       | 3.16              | 364.6          | 2,175,254.97     | 1,302,162.81    |
| 2,471.0    | 34.91      | 20.42      | 2,390.0     | -4,274.0      | 355.5       | 138.6       | 3.54              | 381.5          | 2,175,270.76     | 1,302,168.92    |
| 2,502.0    | 36.05      | 20.60      | 2,415.3     | -4,248.7      | 372.3       | 144.9       | 3.69              | 399.5          | 2,175,287.54     | 1,302,175.43    |



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|------------|------------|------------|-------------|---------------|-------------|-------------|-------------------|----------------|------------------|-----------------|
| 2,532.0    | 37.02      | 21.13      | 2,439.4     | -4,224.6      | 389.0       | 151.3       | 3.40              | 417.4          | 2,175,304.15     | 1,302,181.99    |
| 2,564.0    | 37.72      | 20.60      | 2,464.8     | -4,199.2      | 407.1       | 158.2       | 2.41              | 436.8          | 2,175,322.21     | 1,302,189.13    |
| 2,595.0    | 38.78      | 20.60      | 2,489.2     | -4,174.8      | 425.1       | 164.9       | 3.42              | 456.0          | 2,175,340.09     | 1,302,196.10    |
| 2,626.0    | 39.75      | 20.69      | 2,513.2     | -4,150.8      | 443.5       | 171.8       | 3.13              | 475.6          | 2,175,358.37     | 1,302,203.24    |
| 2,658.0    | 40.36      | 20.51      | 2,537.7     | -4,126.3      | 462.7       | 179.1       | 1.94              | 496.2          | 2,175,377.55     | 1,302,210.72    |
| 2,688.0    | 40.54      | 20.69      | 2,560.5     | -4,103.5      | 481.0       | 185.9       | 0.72              | 515.6          | 2,175,395.69     | 1,302,217.79    |
| 2,720.0    | 41.06      | 20.16      | 2,584.7     | -4,079.3      | 500.6       | 193.2       | 1.95              | 536.6          | 2,175,415.19     | 1,302,225.32    |
| 2,750.0    | 41.42      | 19.90      | 2,607.3     | -4,056.7      | 519.1       | 200.0       | 1.33              | 556.3          | 2,175,433.69     | 1,302,232.32    |
| 2,781.0    | 42.12      | 19.90      | 2,630.4     | -4,033.6      | 538.6       | 207.0       | 2.26              | 577.0          | 2,175,453.02     | 1,302,239.59    |
| 2,813.0    | 43.09      | 20.25      | 2,654.0     | -4,010.0      | 558.9       | 214.5       | 3.12              | 598.6          | 2,175,473.27     | 1,302,247.27    |
| 2,861.0    | 44.58      | 19.46      | 2,688.6     | -3,975.4      | 590.2       | 225.8       | 3.31              | 631.9          | 2,175,504.40     | 1,302,258.94    |
| 2,891.0    | 44.93      | 19.63      | 2,709.9     | -3,954.1      | 610.1       | 232.8       | 1.23              | 653.0          | 2,175,524.22     | 1,302,266.25    |
| 2,921.0    | 45.55      | 19.37      | 2,731.0     | -3,933.0      | 630.2       | 239.9       | 2.16              | 674.3          | 2,175,544.21     | 1,302,273.60    |
| 2,952.0    | 46.34      | 19.28      | 2,752.6     | -3,911.4      | 651.2       | 247.3       | 2.56              | 696.6          | 2,175,565.14     | 1,302,281.23    |
| 2,982.0    | 47.48      | 19.10      | 2,773.1     | -3,890.9      | 671.9       | 254.5       | 3.83              | 718.5          | 2,175,585.74     | 1,302,288.68    |
| 3,012.0    | 48.36      | 19.06      | 2,793.2     | -3,870.8      | 692.9       | 261.8       | 2.94              | 740.7          | 2,175,606.70     | 1,302,296.21    |
| 3,043.0    | 49.15      | 19.49      | 2,813.6     | -3,850.4      | 714.9       | 269.5       | 2.75              | 764.0          | 2,175,628.60     | 1,302,304.17    |
| 3,072.0    | 49.59      | 19.35      | 2,832.5     | -3,831.5      | 735.7       | 276.8       | 1.56              | 786.0          | 2,175,649.27     | 1,302,311.74    |
| 3,103.0    | 50.21      | 20.26      | 2,852.4     | -3,811.6      | 758.0       | 284.8       | 3.01              | 809.7          | 2,175,671.48     | 1,302,320.05    |
| 3,133.0    | 51.09      | 20.75      | 2,871.5     | -3,792.5      | 779.7       | 293.0       | 3.19              | 832.9          | 2,175,693.11     | 1,302,328.44    |
| 3,164.0    | 52.23      | 20.95      | 2,890.7     | -3,773.3      | 802.4       | 301.6       | 3.71              | 857.2          | 2,175,715.72     | 1,302,337.37    |
| 3,194.0    | 53.20      | 20.86      | 2,908.9     | -3,755.1      | 824.7       | 310.1       | 3.24              | 881.1          | 2,175,737.91     | 1,302,346.16    |
| 3,225.0    | 54.26      | 20.65      | 2,927.2     | -3,736.8      | 848.1       | 319.0       | 3.46              | 906.1          | 2,175,761.18     | 1,302,355.30    |
| 3,255.0    | 54.78      | 20.32      | 2,944.6     | -3,719.4      | 871.0       | 327.5       | 1.95              | 930.5          | 2,175,783.96     | 1,302,364.12    |
| 3,285.0    | 55.40      | 19.92      | 2,961.8     | -3,702.2      | 894.1       | 336.0       | 2.34              | 955.1          | 2,175,806.95     | 1,302,372.87    |
| 3,316.0    | 55.57      | 20.53      | 2,979.4     | -3,684.6      | 918.1       | 344.8       | 1.71              | 980.7          | 2,175,830.81     | 1,302,381.99    |
| 3,346.0    | 55.40      | 20.42      | 2,996.4     | -3,667.6      | 941.2       | 353.5       | 0.64              | 1,005.4        | 2,175,853.86     | 1,302,390.92    |



# PathFinder X and Y Report



**Company:** Energen Resources  
**Project:** Rio Arriba County, NM  
**Site:** S-14, T-32N, R-5W (Navajo Lake #100)  
**Well:** Navajo Lake #100  
**Wellbore:** Motherbore  
**Design:** Motherbore (AWB)

**Local Co-ordinate Reference:** Well Navajo Lake #100  
**TVD Reference:** 12' RKB Applied @ 6664.0ft (AWS# 289)  
**MD Reference:** 12' RKB Applied @ 6664.0ft (AWS# 289)  
**North Reference:** True  
**Survey Calculation Method:** Minimum Curvature  
**Database:** 2003.16nwdb

| Survey           |            |             |             |               |             |             |                   |                |                  |                 |  |
|------------------|------------|-------------|-------------|---------------|-------------|-------------|-------------------|----------------|------------------|-----------------|--|
| MD<br>(ft)       | Inc<br>(°) | Azi.<br>(°) | TVD<br>(ft) | TVDSS<br>(ft) | N/S<br>(ft) | E/W<br>(ft) | DLeg<br>(°/100ft) | V. Sec<br>(ft) | Northing<br>(ft) | Easting<br>(ft) |  |
| 3,376.0          | 56.10      | 21.14       | 3,013.2     | -3,650.8      | 964.4       | 362.3       | 3.06              | 1,030.2        | 2,175,876.94     | 1,302,400.00    |  |
| 3,407.0          | 56.72      | 21.68       | 3,030.4     | -3,633.6      | 988.4       | 371.7       | 2.47              | 1,056.0        | 2,175,900.86     | 1,302,409.71    |  |
| 3,439.0          | 57.51      | 22.24       | 3,047.8     | -3,616.2      | 1,013.4     | 381.8       | 2.87              | 1,082.9        | 2,175,925.66     | 1,302,420.07    |  |
| 3,469.0          | 58.56      | 22.81       | 3,063.6     | -3,600.4      | 1,036.9     | 391.5       | 3.85              | 1,108.3        | 2,175,949.05     | 1,302,430.10    |  |
| 3,501.0          | 59.62      | 22.50       | 3,080.1     | -3,583.9      | 1,062.2     | 402.1       | 3.42              | 1,135.8        | 2,175,974.25     | 1,302,440.98    |  |
| 3,532.0          | 61.03      | 22.34       | 3,095.4     | -3,568.6      | 1,087.1     | 412.3       | 4.57              | 1,162.7        | 2,175,999.02     | 1,302,451.56    |  |
| 3,564.0          | 61.99      | 22.22       | 3,110.7     | -3,553.3      | 1,113.1     | 423.0       | 3.02              | 1,190.8        | 2,176,024.92     | 1,302,462.54    |  |
| 3,595.0          | 62.43      | 22.71       | 3,125.2     | -3,538.8      | 1,138.5     | 433.5       | 1.99              | 1,218.2        | 2,176,050.13     | 1,302,473.32    |  |
| 3,626.0          | 63.75      | 22.09       | 3,139.2     | -3,524.8      | 1,164.0     | 444.0       | 4.62              | 1,245.8        | 2,176,075.56     | 1,302,484.17    |  |
| 3,656.1          | 63.92      | 22.34       | 3,152.5     | -3,511.5      | 1,189.1     | 454.3       | 0.94              | 1,272.9        | 2,176,100.48     | 1,302,494.70    |  |
| Start Hold       |            |             |             |               |             |             |                   |                |                  |                 |  |
| 3,658.0          | 63.93      | 22.36       | 3,153.3     | -3,510.7      | 1,190.6     | 454.9       | 0.94              | 1,274.5        | 2,176,102.01     | 1,302,495.35    |  |
| 3,689.0          | 63.93      | 22.09       | 3,166.9     | -3,497.1      | 1,216.4     | 465.4       | 0.78              | 1,302.4        | 2,176,127.66     | 1,302,506.20    |  |
| 3,719.0          | 64.37      | 22.01       | 3,180.0     | -3,484.0      | 1,241.4     | 475.6       | 1.49              | 1,329.4        | 2,176,152.56     | 1,302,516.64    |  |
| 3,749.0          | 64.46      | 22.27       | 3,192.9     | -3,471.1      | 1,266.5     | 485.8       | 0.84              | 1,356.4        | 2,176,177.50     | 1,302,527.14    |  |
| 3,780.0          | 64.28      | 21.74       | 3,206.4     | -3,457.6      | 1,292.4     | 496.2       | 1.65              | 1,384.4        | 2,176,203.28     | 1,302,537.93    |  |
| 3,811.0          | 64.19      | 21.04       | 3,219.8     | -3,444.2      | 1,318.4     | 506.4       | 2.05              | 1,412.3        | 2,176,229.15     | 1,302,548.42    |  |
| 3,841.0          | 63.66      | 20.42       | 3,233.0     | -3,431.0      | 1,343.6     | 515.9       | 2.56              | 1,439.2        | 2,176,254.23     | 1,302,558.27    |  |
| 3,871.0          | 64.37      | 20.51       | 3,246.2     | -3,417.8      | 1,368.9     | 525.4       | 2.38              | 1,466.2        | 2,176,279.38     | 1,302,568.00    |  |
| 3,871.6          | 64.38      | 20.52       | 3,246.4     | -3,417.6      | 1,369.3     | 525.6       | 1.75              | 1,466.7        | 2,176,279.86     | 1,302,568.19    |  |
| Enter Upper Coal |            |             |             |               |             |             |                   |                |                  |                 |  |
| 3,902.0          | 64.81      | 20.86       | 3,259.5     | -3,404.5      | 1,395.0     | 535.3       | 1.75              | 1,494.2        | 2,176,305.45     | 1,302,578.21    |  |
| 3,911.0          | 64.81      | 20.92       | 3,263.3     | -3,400.7      | 1,402.7     | 538.2       | 0.56              | 1,502.3        | 2,176,313.03     | 1,302,581.21    |  |
| 3,931.0          | 64.81      | 21.04       | 3,271.8     | -3,392.2      | 1,419.6     | 544.6       | 0.56              | 1,520.4        | 2,176,329.85     | 1,302,587.89    |  |
| 3,962.0          | 64.98      | 20.95       | 3,285.0     | -3,379.0      | 1,445.8     | 554.7       | 0.61              | 1,548.5        | 2,176,355.93     | 1,302,598.27    |  |
| 3,993.0          | 64.81      | 21.04       | 3,298.1     | -3,365.9      | 1,472.0     | 564.8       | 0.61              | 1,576.6        | 2,176,382.01     | 1,302,608.64    |  |
| 4,024.0          | 64.54      | 20.95       | 3,311.4     | -3,352.6      | 1,498.1     | 574.8       | 0.91              | 1,604.6        | 2,176,408.05     | 1,302,619.00    |  |



## PathFinder X and Y Report



|           |                                      |                              |                                       |
|-----------|--------------------------------------|------------------------------|---------------------------------------|
| Company:  | Energen Resources                    | Local Co-ordinate Reference: | Well Navajo Lake #100                 |
| Project:  | Rio Arriba County, NM                | TVD Reference:               | 12' RKB Applied @ 6664.0ft (AWS# 289) |
| Site:     | S-14, T-32N, R-5W (Navajo Lake #100) | MD Reference:                | 12' RKB Applied @ 6664.0ft (AWS# 289) |
| Well:     | Navajo Lake #100                     | North Reference:             | True                                  |
| Wellbore: | Motherbore                           | Survey Calculation Method:   | Minimum Curvature                     |
| Design:   | Motherbore (AWB)                     | Database:                    | 2003.16nwdb                           |

| Survey        |            |            |             |               |             |             |                   |                |                  |                 |  |
|---------------|------------|------------|-------------|---------------|-------------|-------------|-------------------|----------------|------------------|-----------------|--|
| MD<br>(ft)    | Inc<br>(°) | Azi<br>(°) | TVD<br>(ft) | TVDSS<br>(ft) | N/S<br>(ft) | E/W<br>(ft) | DLeg<br>(°/100ft) | V. Sec<br>(ft) | Northing<br>(ft) | Easting<br>(ft) |  |
| 4,056.0       | 64.37      | 21.57      | 3,325.2     | -3,338.8      | 1,525.0     | 585.3       | 1.83              | 1,633.5        | 2,176,434.83     | 1,302,629.79    |  |
| 4,074.0       | 64.11      | 21.62      | 3,333.0     | -3,331.0      | 1,540.1     | 591.2       | 1.49              | 1,649.7        | 2,176,449.83     | 1,302,635.94    |  |
| 4,086.0       | 63.93      | 21.65      | 3,338.3     | -3,325.7      | 1,550.1     | 595.2       | 1.49              | 1,660.5        | 2,176,459.81     | 1,302,640.04    |  |
| 4,118.0       | 64.10      | 21.74      | 3,352.3     | -3,311.7      | 1,576.9     | 605.8       | 0.59              | 1,689.2        | 2,176,486.40     | 1,302,651.00    |  |
| 4,200.0       | 64.10      | 21.74      | 3,388.1     | -3,275.9      | 1,645.4     | 633.2       | 0.00              | 1,763.0        | 2,176,554.58     | 1,302,679.15    |  |
| TD Motherbore |            |            |             |               |             |             |                   |                |                  |                 |  |

| Targets                                                                  |                  |                 |             |               |               |                  |                 |                  |                   |
|--------------------------------------------------------------------------|------------------|-----------------|-------------|---------------|---------------|------------------|-----------------|------------------|-------------------|
| Target Name                                                              | Dip Angle<br>(°) | Dip Dir.<br>(°) | TVD<br>(ft) | +N/-S<br>(ft) | +E/-W<br>(ft) | Northing<br>(ft) | Easting<br>(ft) | Latitude         | Longitude         |
| - hit/miss target                                                        |                  |                 |             |               |               |                  |                 |                  |                   |
| - Shape                                                                  |                  |                 |             |               |               |                  |                 |                  |                   |
| Enter Upper Coal                                                         | 0.00             | 0.00            | 3,241.0     | 1,373.5       | 521.8         | 2,176,284.07     | 1,302,564.49    | 36° 58' 30.375 N | 107° 24' 23.818 W |
| - survey misses by 7.8ft at 3871.6ft MD (3246.4 TVD, 1369.3 N, 525.6 E)  |                  |                 |             |               |               |                  |                 |                  |                   |
| - Point                                                                  |                  |                 |             |               |               |                  |                 |                  |                   |
| TD Motherbore                                                            | 0.00             | 0.00            | 3,390.0     | 1,672.3       | 635.1         | 2,176,581.47     | 1,302,681.41    | 36° 58' 33.329 N | 107° 24' 22.422 W |
| - survey misses by 27.1ft at 4200.0ft MD (3388.1 TVD, 1645.4 N, 633.2 E) |                  |                 |             |               |               |                  |                 |                  |                   |
| - Point                                                                  |                  |                 |             |               |               |                  |                 |                  |                   |
| Start Hold                                                               | 0.00             | 0.00            | 3,150.0     | 1,191.1       | 452.5         | 2,176,102.53     | 1,302,492.97    | 36° 58' 28.572 N | 107° 24' 24.672 W |
| - survey misses by 3.6ft at 3656.1ft MD (3152.5 TVD, 1189.1 N, 454.3 E)  |                  |                 |             |               |               |                  |                 |                  |                   |
| - Point                                                                  |                  |                 |             |               |               |                  |                 |                  |                   |
| KOP                                                                      | 0.00             | 0.00            | 1,150.0     | 0.0           | 0.0           | 2,174,917.02     | 1,302,026.02    | 36° 58' 16.795 N | 107° 24' 30.248 W |
| - survey misses by 29.2ft at 1151.8ft MD (1151.2 TVD, -26.7 N, -11.8 E)  |                  |                 |             |               |               |                  |                 |                  |                   |
| - Point                                                                  |                  |                 |             |               |               |                  |                 |                  |                   |

|                   |                    |             |
|-------------------|--------------------|-------------|
| Checked By: _____ | Approved By: _____ | Date: _____ |
|-------------------|--------------------|-------------|