

Chesapeake

**Brooke County, WV
Samuel Hubbard BRK
Samuel Hubbard BRK 3H**

Original Hole

Plan: Plan 4 (Turn and Build)

Standard Planning Report

26 June, 2012

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**WV GEOLOGICAL SURVEY
MORGANTOWN, WV**

Planning Report

| | | | |
|-----------|---------------------------|------------------------------|----------------------------------|
| Database: | North East R5000 Database | Local Co-ordinate Reference: | Well Samuel Hubbard BRK 3H |
| Company: | Chesapeake | TVD Reference: | KB ELEV. @ 1247.00ft (NOMAC 337) |
| Project: | Brooke County, WV | MD Reference: | KB ELEV. @ 1247.00ft (NOMAC 337) |
| Site: | Samuel Hubbard BRK | North Reference: | Grid |
| Well: | Samuel Hubbard BRK 3H | Survey Calculation Method: | Minimum Curvature |
| Wellbore: | Original Hole | | |
| Design: | Plan 4 (Turn and Build) | | |

| | | | |
|-------------|--------------------------------------|---------------|----------------|
| Project: | Brooke County, WV | | |
| Map System: | US State Plane 1927 (Exact solution) | System Datum: | Mean Sea Level |
| Geo Datum: | NAD 1927 (NADCON CONUS) | | |
| Map Zone: | West Virginia North 4701 | | |

| | | | | | |
|-----------------------|--------------------|--------------|-------------------|-------------------|------------|
| Site: | Samuel Hubbard BRK | | | | |
| Site Position: | | Northing: | 652,698.67 usft | Latitude: | 40.287271 |
| From: | Lat/Long | Easting: | 1,707,390.41 usft | Longitude: | -80.548823 |
| Position Uncertainty: | 0.00 ft | Slot Radius: | 13.200 in | Grid Convergence: | -0.67 ° |

| | | | | | | |
|----------------------|-----------------------|---------|---------------------|-------------------|---------------|-------------|
| Well: | Samuel Hubbard BRK 3H | | | | | |
| Well Position | +N/-S | 0.00 ft | Northing: | 652,698.67 usft | Latitude: | 40.287271 |
| | +E/-W | 0.00 ft | Easting: | 1,707,390.41 usft | Longitude: | -80.548823 |
| Position Uncertainty | | 0.00 ft | Wellhead Elevation: | | Ground Level: | 1,225.00 ft |

| | | | | | |
|-----------|---------------|-------------|-----------------|---------------|---------------------|
| Wellbore: | Original Hole | | | | |
| Magnetics | Model Name | Sample Date | Declination (°) | Dip Angle (°) | Field Strength (nT) |
| | IGRF2010 | 5/17/2012 | -8.80 | 67.76 | 53,021 |

| | | | | | |
|-------------------|-------------------------|------------|---------------|---------------|--|
| Design: | Plan 4 (Turn and Build) | | | | |
| Audit Notes: | | | | | |
| Version: | Phase: | PROTOTYPE | Tie On Depth: | 9,700.00 | |
| Vertical Section: | Depth From (TVD) (ft) | +N/-S (ft) | +E/-W (ft) | Direction (°) | |
| | 0.00 | 0.00 | 0.00 | 347.00 | |

| Measured Depth (ft) | Inclination (°) | Azimuth (°) | Vertical Depth (ft) | +N/-S (ft) | +E/-W (ft) | Dogleg Rate (°/100ft) | Build Rate (°/100ft) | Turn Rate (°/100ft) | TFO (°) | Target |
|---------------------|-----------------|-------------|---------------------|------------|------------|-----------------------|----------------------|---------------------|---------|----------------------|
| 9,700.00 | 18.30 | 168.77 | 9,691.36 | -84.25 | -59.09 | 0.00 | 0.00 | 0.00 | 0.00 | |
| 10,027.53 | 15.02 | 90.00 | 10,005.09 | -140.77 | 6.66 | 6.97 | -1.00 | -24.05 | -98.25 | |
| 10,970.35 | 90.80 | 346.35 | 10,592.83 | 459.19 | 20.98 | 10.00 | 8.04 | -10.99 | -103.00 | Revised PBHL (S.H.3) |
| 14,901.30 | 90.80 | 346.35 | 10,537.95 | 4,278.66 | -906.91 | 0.00 | 0.00 | 0.00 | 0.00 | Revised PBHL (S.H.3) |

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| Project | Brooke County, WV | MD Reference | KB ELEV. @ 1247.00ft (NOMAC 337) |
| Site | Samuel Hubbard BRK | North Reference | Grid |
| Well | Samuel Hubbard BRK 3H | Survey Calculation Method | Minimum Curvature |
| Wellbore | Original Hole | | |
| Design | Plan 4 (Turn and Build) | | |

| Planned Survey | | | | | | | | | | |
|---------------------|-----------------|-------------|---------------------|-----------|-----------|-----------------------|-----------------------|----------------------|---------------------|--|
| Measured Depth (ft) | Inclination (°) | Azimuth (°) | Vertical Depth (ft) | +N/S (ft) | +E/W (ft) | Vertical Section (ft) | Dogleg Rate (°/100ft) | Build Rate (°/100ft) | Turn Rate (°/100ft) | |
| 9,700.00 | 18.30 | 168.77 | 9,691.36 | -84.25 | -59.09 | -68.80 | 0.00 | 0.00 | 0.00 | |
| 9,800.00 | 17.30 | 144.72 | 9,786.57 | -112.15 | -47.16 | -98.67 | 7.37 | -1.00 | -24.05 | |
| 9,900.00 | 16.30 | 120.67 | 9,882.30 | -131.65 | -26.11 | -122.41 | 6.97 | -1.00 | -24.05 | |
| 10,000.00 | 15.30 | 96.62 | 9,978.52 | -140.35 | -0.52 | -136.64 | 6.58 | -1.00 | -24.05 | |
| 10,027.53 | 15.02 | 90.00 | 10,005.09 | -140.77 | 6.66 | -138.66 | 6.37 | -1.00 | -24.05 | |
| 10,100.00 | 15.10 | 61.85 | 10,075.17 | -136.31 | 24.40 | -138.30 | 10.00 | 0.11 | -38.84 | |
| 10,200.00 | 20.00 | 32.37 | 10,170.67 | -115.66 | 45.10 | -122.84 | 10.00 | 4.90 | -29.48 | |
| 10,300.00 | 27.71 | 16.36 | 10,262.15 | -78.82 | 60.85 | -90.49 | 10.00 | 7.70 | -16.01 | |
| 10,400.00 | 36.47 | 7.23 | 10,346.84 | -26.90 | 71.17 | -42.21 | 10.00 | 8.77 | -9.13 | |
| 10,500.00 | 45.70 | 1.31 | 10,422.16 | 38.53 | 75.74 | 20.51 | 10.00 | 9.22 | -5.92 | |
| 10,600.00 | 55.14 | 357.03 | 10,485.82 | 115.47 | 74.43 | 95.77 | 10.00 | 9.44 | -4.28 | |
| 10,700.00 | 64.70 | 353.64 | 10,535.89 | 201.59 | 67.28 | 181.29 | 10.00 | 9.56 | -3.39 | |
| 10,800.00 | 74.33 | 350.75 | 10,570.85 | 294.27 | 54.51 | 274.47 | 10.00 | 9.63 | -2.89 | |
| 10,900.00 | 83.99 | 348.13 | 10,589.64 | 390.69 | 36.50 | 372.47 | 10.00 | 9.66 | -2.63 | |
| 10,970.35 | 90.80 | 346.35 | 10,592.83 | 459.19 | 20.98 | 442.71 | 10.00 | 9.67 | -2.53 | |
| 11,000.00 | 90.80 | 346.35 | 10,592.42 | 488.00 | 13.98 | 472.35 | 0.00 | 0.00 | 0.00 | |
| 11,100.00 | 90.80 | 346.35 | 10,591.02 | 585.16 | -9.62 | 572.34 | 0.00 | 0.00 | 0.00 | |
| 11,200.00 | 90.80 | 346.35 | 10,589.62 | 682.33 | -33.23 | 672.32 | 0.00 | 0.00 | 0.00 | |
| 11,300.00 | 90.80 | 346.35 | 10,588.23 | 779.49 | -56.83 | 772.30 | 0.00 | 0.00 | 0.00 | |
| 11,400.00 | 90.80 | 346.35 | 10,586.83 | 876.66 | -80.44 | 872.29 | 0.00 | 0.00 | 0.00 | |
| 11,500.00 | 90.80 | 346.35 | 10,585.44 | 973.82 | -104.04 | 972.27 | 0.00 | 0.00 | 0.00 | |
| 11,600.00 | 90.80 | 346.35 | 10,584.04 | 1,070.98 | -127.65 | 1,072.25 | 0.00 | 0.00 | 0.00 | |
| 11,700.00 | 90.80 | 346.35 | 10,582.64 | 1,168.15 | -151.25 | 1,172.24 | 0.00 | 0.00 | 0.00 | |
| 11,800.00 | 90.80 | 346.35 | 10,581.25 | 1,265.31 | -174.86 | 1,272.22 | 0.00 | 0.00 | 0.00 | |
| 11,900.00 | 90.80 | 346.35 | 10,579.85 | 1,362.48 | -198.46 | 1,372.21 | 0.00 | 0.00 | 0.00 | |
| 12,000.00 | 90.80 | 346.35 | 10,578.45 | 1,459.64 | -222.07 | 1,472.19 | 0.00 | 0.00 | 0.00 | |
| 12,100.00 | 90.80 | 346.35 | 10,577.06 | 1,556.80 | -245.67 | 1,572.17 | 0.00 | 0.00 | 0.00 | |
| 12,200.00 | 90.80 | 346.35 | 10,575.66 | 1,653.97 | -269.28 | 1,672.16 | 0.00 | 0.00 | 0.00 | |
| 12,300.00 | 90.80 | 346.35 | 10,574.27 | 1,751.13 | -292.88 | 1,772.14 | 0.00 | 0.00 | 0.00 | |
| 12,400.00 | 90.80 | 346.35 | 10,572.87 | 1,848.30 | -316.49 | 1,872.12 | 0.00 | 0.00 | 0.00 | |
| 12,500.00 | 90.80 | 346.35 | 10,571.47 | 1,945.46 | -340.09 | 1,972.11 | 0.00 | 0.00 | 0.00 | |
| 12,600.00 | 90.80 | 346.35 | 10,570.08 | 2,042.62 | -363.70 | 2,072.09 | 0.00 | 0.00 | 0.00 | |
| 12,700.00 | 90.80 | 346.35 | 10,568.68 | 2,139.79 | -387.30 | 2,172.07 | 0.00 | 0.00 | 0.00 | |
| 12,800.00 | 90.80 | 346.35 | 10,567.28 | 2,236.95 | -410.90 | 2,272.06 | 0.00 | 0.00 | 0.00 | |
| 12,900.00 | 90.80 | 346.35 | 10,565.89 | 2,334.12 | -434.51 | 2,372.04 | 0.00 | 0.00 | 0.00 | |
| 13,000.00 | 90.80 | 346.35 | 10,564.49 | 2,431.28 | -458.11 | 2,472.03 | 0.00 | 0.00 | 0.00 | |
| 13,100.00 | 90.80 | 346.35 | 10,563.10 | 2,528.45 | -481.72 | 2,572.01 | 0.00 | 0.00 | 0.00 | |
| 13,200.00 | 90.80 | 346.35 | 10,561.70 | 2,625.61 | -505.32 | 2,671.99 | 0.00 | 0.00 | 0.00 | |
| 13,300.00 | 90.80 | 346.35 | 10,560.30 | 2,722.77 | -528.93 | 2,771.98 | 0.00 | 0.00 | 0.00 | |
| 13,400.00 | 90.80 | 346.35 | 10,558.91 | 2,819.94 | -552.53 | 2,871.96 | 0.00 | 0.00 | 0.00 | |
| 13,500.00 | 90.80 | 346.35 | 10,557.51 | 2,917.10 | -576.14 | 2,971.94 | 0.00 | 0.00 | 0.00 | |
| 13,600.00 | 90.80 | 346.35 | 10,556.12 | 3,014.27 | -599.74 | 3,071.93 | 0.00 | 0.00 | 0.00 | |
| 13,700.00 | 90.80 | 346.35 | 10,554.72 | 3,111.43 | -623.35 | 3,171.91 | 0.00 | 0.00 | 0.00 | |
| 13,800.00 | 90.80 | 346.35 | 10,553.32 | 3,208.59 | -646.95 | 3,271.89 | 0.00 | 0.00 | 0.00 | |
| 13,900.00 | 90.80 | 346.35 | 10,551.93 | 3,305.76 | -670.56 | 3,371.88 | 0.00 | 0.00 | 0.00 | |
| 14,000.00 | 90.80 | 346.35 | 10,550.53 | 3,402.92 | -694.16 | 3,471.86 | 0.00 | 0.00 | 0.00 | |
| 14,100.00 | 90.80 | 346.35 | 10,549.13 | 3,500.09 | -717.77 | 3,571.85 | 0.00 | 0.00 | 0.00 | |
| 14,200.00 | 90.80 | 346.35 | 10,547.74 | 3,597.25 | -741.37 | 3,671.83 | 0.00 | 0.00 | 0.00 | |
| 14,300.00 | 90.80 | 346.35 | 10,546.34 | 3,694.41 | -764.98 | 3,771.81 | 0.00 | 0.00 | 0.00 | |
| 14,400.00 | 90.80 | 346.35 | 10,544.95 | 3,791.58 | -788.58 | 3,871.80 | 0.00 | 0.00 | 0.00 | |
| 14,500.00 | 90.80 | 346.35 | 10,543.55 | 3,888.74 | -812.18 | 3,971.78 | 0.00 | 0.00 | 0.00 | |
| 14,600.00 | 90.80 | 346.35 | 10,542.15 | 3,985.91 | -835.79 | 4,071.76 | 0.00 | 0.00 | 0.00 | |
| 14,700.00 | 90.80 | 346.35 | 10,540.76 | 4,083.07 | -859.39 | 4,171.75 | 0.00 | 0.00 | 0.00 | |
| 14,800.00 | 90.80 | 346.35 | 10,539.36 | 4,180.24 | -883.00 | 4,271.73 | 0.00 | 0.00 | 0.00 | |

Planning Report

| | | | |
|----------|---------------------------|-----------------------------|----------------------------------|
| Database | North East R5000 Database | Local Co-ordinate Reference | Well Samuel Hubbard BRK 3H |
| Company | Chesapeake | TVD Reference | KB ELEV. @ 1247.00ft (NOMAC 337) |
| Project | Brooke County, WV | MD Reference | KB ELEV. @ 1247.00ft (NOMAC 337) |
| Site | Samuel Hubbard BRK | North Reference | Grid |
| Well | Samuel Hubbard BRK 3H | Survey Calculation Method | Minimum Curvature |
| Wellbore | Original Hole | | |
| Design | Plan 4 (Turn and Build) | | |

| Planned Survey | | | | | | | | | | |
|---------------------|-----------------|-------------|---------------------|------------|------------|-----------------------|-----------------------|----------------------|---------------------|--|
| Measured Depth (ft) | Inclination (°) | Azimuth (°) | Vertical Depth (ft) | +N/-S (ft) | +E/-W (ft) | Vertical Section (ft) | Dogleg Rate (°/100ft) | Build Rate (°/100ft) | Turn Rate (°/100ft) | |
| 14,900.00 | 90.80 | 346.35 | 10,537.96 | 4,277.40 | -906.60 | 4,371.72 | 0.00 | 0.00 | 0.00 | |
| 14,901.30 | 90.80 | 346.35 | 10,537.95 | 4,278.66 | -906.91 | 4,373.01 | 0.00 | 0.00 | 0.00 | |

| Design Targets | | | | | | | | | | |
|---|-----------------|---------------|--------------|-----------|------------|------------|-----------------|----------------|-----------|------------|
| Target Name | hit/miss target | Dip Angle (°) | Dip Dir. (°) | TVD (ft) | +N/-S (ft) | +E/-W (ft) | Northing (usft) | Easting (usft) | Latitude | Longitude |
| Revised PBHL (S.H.3H) | | 0.00 | 360.00 | 10,537.93 | 4,278.66 | -906.91 | 656,977.32 | 1,706,483.50 | 40.298986 | -80.552253 |
| - plan misses target center by 0.02ft at 14901.30ft MD (10537.95 TVD, 4278.66 N, -906.91 E) | | | | | | | | | | |
| - Point | | | | | | | | | | |

| Formations | | | | | | |
|---------------------|---------------------|-----------------------------------|-----------|---------|-------------------|--|
| Measured Depth (ft) | Vertical Depth (ft) | Name | Lithology | Dip (°) | Dip Direction (°) | |
| 10,836.72 | 10,579.67 | -15' | | -0.80 | 347.00 | |
| 10,966.54 | 10,592.87 | TGT: 10599' TVD @ 0°VS, 90.8° Inc | | -0.80 | 347.00 | |

| Plan Annotations | | | | | |
|---------------------|---------------------|-------------------|------------|---|--|
| Measured Depth (ft) | Vertical Depth (ft) | Local Coordinates | | Comment | |
| | | +N/-S (ft) | +E/-W (ft) | | |
| 9,700.00 | 9,691.36 | -84.25 | -59.09 | Exit Low and Left:[9700.00' MD][6.97°/100' DLS] | |
| 10,027.53 | 10,005.09 | -140.77 | 6.66 | Build:[10027.53' MD][10°/100' DLS] | |
| 10,970.35 | 10,592.83 | 459.19 | 20.98 | Hold:[10970.35' MD][90.80° Inc][346.35° Azi] | |
| 14,901.30 | 10,537.95 | 4,278.66 | -906.91 | TD:[14901.30' MD][10537.95' TVD] | |

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