

CNX SHR-38D-HSM Surveys Off to 20135ft MD Survey Geodetic Report

(Def Survey)

Report Date: July 17, 2019 - 04:51 PM
 Client: CNX Gas
 Field: WV Tyler County (NAD 27)
 Structure / Slot: CNX SHR-38 Pad / SHR-38D-HSM
 Well: SHR-38D-HSM
 Borehole: Original Borehole
 UWI / API#: Unknown / Unknown
 Survey Name: CNX SHR-38D-HSM Surveys Off to 20135ft MD
 Survey Date: May 31, 2019
 Tort / AHD / DDI / ERD Ratio: 257.009 / 15415.082 / 7.001 / 2.360
 Coordinate Reference System: NAD2011 West Virginia State Plane, Northern Zone, US Feet
 Location Lat / Long: N 30° 22' 16.546011", W 80° 07' 52.52350"
 Location Grid NE Y/X: N 320137.558 NUS, E 1622477.867 NUS
 CRS Grid Convergence Angle: -0.8517 °
 Grid Scale Factor: 0.99995057
 Version / Patch: 2.10.753.0

Survey / DLS Computation: Minimum Curvature / Lubinski
 Vertical Section Azimuth: 161.000 ° (Grid North)
 Vertical Section Origin: 0.000 ft, 0.000 ft
 TVD Reference Datum: KB
 TVD Reference Elevation: 1040.420 above MSL
 Seated / Ground Elevation: 1011.860 above MSL
 Magnetic Declination: -7.708 °
 Total Gravity Field Strength: 999.3213mgn (0.80065 Based)
 Gravity Model: GARM
 Total Magnetic Field Strength: 51222.020 nT
 Magnetic Dip Angle: 86.448 °
 Declination Date: July 01, 2019
 Magnetic Declination Model: HDGM 2019
 North Reference: Grid North
 Grid Convergence Used: -0.8517 °
 Total Corr Mag North-Grid North: -6.8565 °
 Local Coord Referenced To: Well Head

Comments	MD (m)	Incl (°)	Azim Grid	TVD (m)	TVDS (m)	VSECC (m)	NS	EW	DLS (Ft/m)	TF	BR (Ft/m)	TR	Northing (mUS)	Easting (mUS)	Latitude (mUS)	Longitude (mUS)	Directional Index
SHL	11.00	0.00	0.00	-1040.42	0.00	0.00	0.00	0.00	N/A	288.692	N/A	N/A	320137.56	1622477.87	30.3712630	-80.8354232	0.00
	115.00	0.21	288.09	115.00	-825.42	-0.13	0.07	-0.20	0.18	257.898	0.18	0.00	320137.63	1622477.67	30.3712631	-80.8354230	0.00
	215.00	0.31	257.86	215.00	-825.42	-0.27	0.07	-0.64	0.17	228.11M	0.10	-13.13	320137.63	1622477.23	30.3712630	-80.8354258	0.00
	315.00	0.31	257.11	315.00	-725.42	-0.19	-0.17	-1.10	0.17	209.81M	0.00	-31.75	320137.38	1622476.77	30.3712625	-80.8354270	0.00
	415.00	0.29	208.81	415.00	-625.42	0.00	-0.58	-1.42	0.06	255.11M	-0.02	-16.30	320136.98	1622476.45	30.3712618	-80.8354282	0.00
	515.00	0.33	255.11	514.99	-525.43	0.23	-0.77	-1.82	0.24	220.48M	0.04	46.30	320136.68	1622476.05	30.3712605	-80.8354296	0.29
	615.00	0.18	220.48	614.99	-425.43	0.29	-1.07	-2.20	0.18	350.56M	0.15	-34.63	320136.48	1622475.67	30.3712601	-80.8354309	0.46
	715.00	0.16	350.56	714.99	-325.43	0.20	-1.11	-2.32	0.25	269.77M	-0.09	150.07	320136.45	1622475.45	30.3712599	-80.8354316	0.57
	815.00	0.30	269.77	814.99	-225.43	0.13	-1.03	-2.59	0.30	225.99M	0.21	-80.78	320136.53	1622475.28	30.3712600	-80.8354323	0.71
	915.00	0.28	225.99	914.99	-125.43	0.15	-1.20	-3.03	0.22	260.17M	-0.02	43.78	320136.35	1622474.84	30.3712590	-80.8354337	0.82
	1015.00	0.26	260.17	1014.99	-25.43	0.22	-1.41	-3.43	0.16	295.61M	-0.02	34.18	320136.15	1622474.44	30.3712591	-80.8354352	0.91
	1115.00	0.15	295.61	1114.99	74.57	0.06	-1.36	-3.77	0.16	167.77M	-0.11	35.44	320136.16	1622474.10	30.3712595	-80.8354364	0.98
	1215.00	0.10	167.77	1214.99	174.57	0.06	-1.42	-4.02	0.23	150.45M	0.14	-12.84	320136.51	1622474.00	30.3712587	-80.8354369	1.04
	1315.00	0.40	150.45	1314.99	274.57	0.02	-1.81	-3.86	0.31	141.66M	0.30	-11.32	320135.75	1622474.19	30.3712579	-80.8354361	1.13
	1415.00	0.54	141.66	1414.99	374.57	1.30	-2.48	-3.21	0.16	140.87M	0.14	-8.96	320135.07	1622474.85	30.3712568	-80.8354345	1.22
	1515.00	0.87	140.87	1514.98	474.56	2.30	-3.21	-2.55	0.13	133.58M	0.13	-6.52	320134.25	1622475.32	30.3712585	-80.8354320	0.71
	1615.00	0.85	133.58	1614.87	574.55	3.50	-4.27	-1.84	0.20	120.62M	0.18	-7.37	320132.22	1622476.22	30.3712514	-80.8354281	1.42
	1715.00	1.02	120.62	1714.99	674.54	4.84	-5.24	-0.34	0.27	130.21M	0.17	-12.56	320133.32	1622477.53	30.3712484	-80.8354215	1.53
	1815.00	0.71	130.21	1814.95	774.53	6.06	-6.10	0.89	0.34	129.87M	-0.31	8.29	320131.48	1622478.76	30.3712453	-80.8354193	1.63
	1915.00	0.72	129.87	1914.94	874.52	7.13	-6.90	1.85	0.01	128.47M	0.01	-4.24	320130.60	1622479.72	30.3712441	-80.8354152	1.68
	2015.00	0.47	125.47	2014.93	974.51	8.00	-7.54	2.67	0.25	103.49M	-0.25	-4.50	320130.02	1622480.53	30.3712434	-80.8354140	1.74
	2115.00	0.54	103.49	2114.93	1074.51	8.55	-8.28	3.40	0.18	106.77M	0.10	-22.06	320129.51	1622481.81	30.3712419	-80.8354129	1.82
	2215.00	0.31	106.77	2214.83	1174.51	8.93	-8.05	4.06	0.16	107.31M	-0.16	2.71	320129.51	1622481.92	30.3712411	-80.8354064	1.78
	2315.00	0.06	107.31	2314.83	1274.51	9.15	-8.20	4.29	0.32	177.21M	-0.22	91.14	320129.36	1622482.16	30.3712401	-80.8354071	1.86
	2415.00	0.19	177.21	2414.83	1374.51	9.37	-8.44	4.28	0.11	191.63M	0.10	-20.10	320129.12	1622482.14	30.3712405	-80.8354075	1.88
	2515.00	0.20	191.63	2514.83	1474.51	9.98	-8.77	4.25	0.06	180.87M	0.01	14.42	320128.70	1622482.12	30.3712391	-80.8354072	1.89
	2552.00	0.15	86.00	2551.83	1511.51	9.75	-8.83	4.20	0.75	221.36M	-0.14	-28.49	320128.73	1622482.15	30.3712389	-80.8354070	1.92
	2640.00	0.32	221.36	2639.83	1589.51	9.90	-9.00	4.24	0.50	227.43M	0.14	153.32	320128.52	1622482.11	30.3712384	-80.8354062	2.04
	2724.00	1.86	237.43	2723.83	1663.49	10.82	-9.00	2.97	1.78	242.62M	1.76	16.13	320127.86	1622480.84	30.3712359	-80.8354119	2.10
	2809.00	3.13	242.62	2808.83	1708.41	10.98	-11.68	-0.21	1.58	249.29M	1.56	6.11	320125.88	1622477.85	30.3712305	-80.8354236	2.26
	2903.00	4.61	249.29	2902.84	1852.22	11.41	-13.03	-5.41	1.84	255.83M	1.76	7.90	320123.63	1622472.46	30.3712247	-80.8354161	2.43
	2978.00	5.94	255.83	2977.27	1906.85	11.15	-16.22	-12.87	1.72	251.91M	1.56	0.00	320121.34	1622465.00	30.3712178	-80.8354678	2.20
	3052.00	7.24	251.91	3050.72	2020.30	10.70	-18.00	-22.11	1.54	248.03M	1.55	-4.87	320118.63	1622455.78	30.3711917	-80.8355043	2.76
	3146.00	8.57	248.03	3143.92	2103.92	10.94	-22.91	-32.95	1.71	13.17L	1.56	-4.52	320114.46	1622448.76	30.3711879	-80.8355385	3.03
	3232.00	10.36	245.96	3232.74	2188.32	11.99	-28.50	-45.96	2.16	5.91R	2.12	-2.73	320109.86	1622441.91	30.3711829	-80.8355826	3.26
	3318.00	11.95	246.42	3313.11	2272.60	13.42	-35.26	-61.19	1.82	17.11R	1.81	0.86	320102.30	1622416.86	30.3711834	-80.8356377	3.10
	3401.00	13.77	248.76	3394.82	2355.60	14.46	-42.86	-78.27	1.25	8.22R	2.82	1.00	320096.28	1622396.81	30.3711839	-80.8356781	3.32
	3486.00	15.37	246.62	3476.29	2435.87	15.16	-46.86	-96.26	1.00	1.96L	1.88	1.01	320087.70	1622376.61	30.3711214	-80.8357081	3.43
	3572.00	16.84	246.47	3558.91	2518.49	15.76	-58.20	-120.61	1.71	22.49R	1.71	-1.07	320079.36	1622357.28	30.3710983	-80.8358467	3.54
	3658.00	18.46	251.57	3640.86	2600.44	15.96	-66.88	-145.20	2.42	14.39L	1.88	2.44	320070.80	1622332.58	30.3710732	-80.8359321	3.64
	3743.00	20.45	253.01	3721.00	2680.58	15.31	-75.47	-172.17	2.01	3.54L	2.34	1.60	320062.09	1622305.71	30.3710483	-80.8360215	3.74
	3828.00	22.06	252.74	3800.21	2759.79	14.30	-84.55	-201.63	0.90	0.62R	1.93	-0.32	320053.01	1622272.24	30.3710229	-80.8361188	3.82
	3912.00	24.13	252.82	3877.47	2837.05	13.27	-93.77	-233.12	0.50	0.12L	1.63	0.14	320044.32	1622242.11	30.3710004	-80.8362122	3.90
	3996.00	26.27	252.14	3952.58	2912.16	12.67	-104.95	-266.70	2.54	0.26R	2.52	-0.82	320032.62	1622211.00	30.3709945	-80.8363123	4.00
	4080.00	28.34	252.16	4028.12	2987.70	11.59	-116.89	-303.87	2.49	0.73L	2.49	0.02	320020.68	1622174.01	30.3709275	-80.8364175	4.08
	4166.00	30.42	251.61	4103.06	3062.84	10.94	-130.01	-343.97	2.44	3.98R	2.42	-0.64	320007.55	1622132.92	30.3708200	-80.8365286	4.15
	4251.00	33.14	251.93	4175.30	3134.88	10.34	-144.01	-386.48	3.21	6.26L	3.20	0.38	319993.56	1622091.40	30.3708163	-80.8367824	4.23
	4337.00	35.30	251.52	4246.41	3205.99	9.73	-158.18	-432.40	2.53	3.84R	2.51	-0.46	319978.39	1622045.40	30.3708081	-80.8369440	4.31
	4422.00	36.36	251.94	4315.33	3274.91	9.23	-174.90	-479.01	1.25	115.71L	1.25	0.14	319962.87	1621998.28	30.3707932	-80.8371022	4.36
	4507.00	38.23	252.10	4383.83	3343.41	8.46	-192.56	-527.43	0.35	79.64R	-0.15	0.54	319947.01	1621950.47	30.3707183	-80.8372780	4.41
	4591.00	36.31	252.84	4451.56	3411.14	7.19	-206.52	-574.81	0.53	2.5L	0.10	0.88	319932.04	1621903.08	30.3706736	-80.8374430	4.45
	4676.00	35.67	252.79	4519.75	3479.20	5.58	-220.53	-622.29	0.81	42.44R	0.81	-0.06	319917.65	1621854.61	30.3706222	-80.8376196	4.49
	4762.00	34.02	254.29	3547.55	3547.55	3.25	-235.35	-673.51	1.59	123.74L	1.19	1.74	319902.22	1621804.39	30.3705866	-80.8377927	4.54
	4847.00	37.76	253.65	4655.05	3614.83	0.55	-249.76	-723.58	0.55	90.33R	-0.31	-0.75	319887.81	1621754.22	30.3705478	-80.8379644	4.57
	4931.00	38.04	254.44	4721.33	3680.91	-2.20	-263.94	-773.29	0.67	149.85L	0.33	0.94	319873.63	1621704.81	30.3705088	-80.8381411	4.61
	5017.00	37.85	254.26	4789.15	3748.73	-5.29	-278.21	-824.21	0.26	124.83L	-0.22	-0.21	319859.36	1621655.70	30.3704654	-80.8383250	4.54
	5102.00	37.24	252.79	4856.55	3816.13	-7.8											

Comments	MD (ft)	Incl (°)	Azim Grid (°)	TVD (ft)	TVDSS (ft)	VSEC (ft)	NS (ft)	EW (ft)	DLS (ft/100ft)	TF (ft)	BR (ft/100ft)	TR (ft/100ft)	Northing (ft)	Easting (ft)	Latitude (°)	Longitude (°)	Directional Dip/Gravity Index
	10010.00	90.17	100.82	6527.12	5486.70	13047.64	-13038.53	2210.80	0.49	102.06L	-0.05	-0.45	307069.70	1824688.66	30.33556035	-80.827602326	7.08
	20004.00	90.11	100.54	6526.80	5486.47	13141.84	-13127.23	2241.60	0.30	75.78R	-0.06	-0.30	307011.00	1824710.88	30.33531810	-80.827606890	7.07
	20008.00	90.45	101.88	6526.43	5486.01	13226.83	-13216.22	2272.18	1.47	87.86R	0.38	1.43	306922.02	1824749.93	30.33507504	-80.82760703	7.06
	20183.00	90.50	103.12	6526.04	5485.22	13230.89	-13206.82	2300.75	1.31	90R	0.05	1.31	306831.42	1824778.40	30.33482749	-80.82760132	7.08
Final Survey	20267.00	90.50	104.53	6524.82	5484.40	13424.77	-13397.09	2329.83	1.50	HS	0.00	1.50	306741.15	1824804.88	30.33458074	-80.82764406	7.09
FTB	20316.00	90.50	104.53	6524.58	5484.16	13452.72	-13424.06	2334.40	0.00		0.00	0.00	306714.17	1824812.14	30.33450987	-80.827649225	7.09

Survey Type: Def Survey

Survey Error Model: ISCWSA Rev 0 *** 3-D 95.000% Confidence 2.7955 sigma
 Survey Program:

Description	Part	MD From (ft)	MD To (ft)	EOU Freq (ft)	Hole Size (in)	Casing Diameter (in)	Survey Tool Type	Borehole / Survey
	1	0.000	28.770	1/88.425	30.000	30.000	NAL_MSG+MSHOT-Depth Only	Original Borehole / CNX SHR-38D-HSM Surveys 0ft to 20135ft MD
	1	28.770	28.770	Act Str	30.000	30.000	NAL_MSG+MSHOT-Depth Only	Original Borehole / CNX SHR-38D-HSM Surveys 0ft to 20135ft MD
	1	28.770	2552.000	Act Str	30.000	30.000	NAL_MSG+MSHOT	Original Borehole / CNX SHR-38D-HSM Surveys 0ft to 20135ft MD
	1	2552.000	6641.000	Act Str	30.000	30.000	NAL_MWD-NON_SLB	Original Borehole / CNX SHR-38D-HSM Surveys 0ft to 20135ft MD
	1	6641.000	20316.000	Act Str	30.000	30.000	NAL_MWD_1.0_DEG	Original Borehole / CNX SHR-38D-HSM Surveys 0ft to 20135ft MD

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WV Department of
Environmental Protection