



**Shale Rock Properties**  
**Summary of Routine Crushed Core Analyses Results**  
As-Received and Vacuum Dried at 212°F

Noble Energy, Inc  
Lone Pine LB19-78HN Well  
West Pony Field

Weld County, Colorado  
File no.: CO-73179  
Date: 1/27/15

Sample ID	Top Depth, feet	Bottom Depth, feet	A-R Bulk Density, gm/cc	A-R Water Saturation, % of PV	A-R Oil Saturation, % of PV	A-R Gas Saturation, % of PV	A-R Gas Saturation, % of BV	A-R Press Decay Permeability, md	Dry Bulk Density, gm/cc	Dry Grain Density, gm/cc	Dry Helium Porosity, % of BV	Dry Press Decay Permeability, md
1-17 SRP	6678.20	6678.50	2.56	76.3	0.4	23.3	1.8	1.42E-05	2.50	2.71	7.6	1.43E-03
1-38 SRP	6699.15	6699.45	2.57	83.2	1.4	15.4	1.1	3.96E-05	2.50	2.69	7.2	1.35E-03
1-42 SRP	6703.20	6703.50	2.58	77.6	1.7	20.7	1.4	5.11E-05	2.52	2.70	6.9	1.33E-03
1-45 SRP	6706.00	6706.30	2.59	75.4	3.5	21.1	1.3	3.90E-05	2.54	2.71	6.4	1.28E-03
1-51 SRP	6712.05	6712.35	2.57	65.3	11.1	23.6	1.5	2.14E-05	2.52	2.69	6.3	1.19E-03
1-54 SRP	6715.55	6715.85	2.55	79.6	3.8	16.6	1.3	5.98E-05	2.49	2.69	7.6	1.21E-03
1-60 SRP	6721.00	6721.30	2.57	77.7	4.3	18.0	1.2	8.97E-06	2.51	2.70	6.8	1.10E-03
1-63 SRP	6724.00	6724.25	2.60	57.8	16.5	25.7	1.4	1.60E-05	2.56	2.71	5.6	1.14E-03
1-69 SRP	6730.00	6730.30	2.57	72.7	10.3	17.0	1.1	1.06E-05	2.52	2.68	6.2	8.33E-04
1-72 SRP	6733.10	6733.40	2.59	68.8	8.3	22.9	1.2	1.59E-05	2.55	2.69	5.3	1.26E-03
1-78 SRP	6739.10	6739.40	2.63	47.6	25.4	27.0	1.2	1.47E-05	2.60	2.71	4.3	1.23E-03
1-81 SRP	6742.10	6742.40	2.59	83.1	6.0	10.9	0.6	1.04E-05	2.54	2.69	5.6	1.11E-03
1-87 SRP	6748.10	6748.40	2.58	85.0	5.4	9.6	0.6	7.86E-06	2.52	2.68	6.3	9.55E-04
1-90 SRP	6751.20	6751.50	2.62	58.9	10.8	30.3	1.3	1.69E-05	2.59	2.70	4.1	1.05E-03
1-96 SRP	6757.00	6757.25	2.57	60.6	27.3	12.1	0.6	7.70E-06	2.53	2.66	5.1	3.65E-04
1-99 SRP	6760.15	6760.45	2.56	61.8	26.6	11.6	0.6	1.61E-05	2.52	2.65	4.9	2.60E-04
1-105 SRP	6766.20	6766.50	2.61	80.0	3.9	16.1	0.8	1.29E-05	2.57	2.70	4.9	1.21E-03
1-108 SRP	6769.00	6769.35	2.62	86.2	0.0	13.8	0.7	1.55E-05	2.57	2.71	5.2	1.17E-03
1-114 SRP	6775.20	6775.50	2.59	72.4	6.6	21.0	1.1	1.06E-05	2.55	2.69	5.4	1.28E-03
1-117 SRP	6778.15	6778.45	2.61	87.1	0.0	12.9	0.7	3.31E-05	2.56	2.71	5.3	1.48E-03
1-123 SRP	6784.05	6784.35	2.56	77.6	15.2	7.2	0.4	8.27E-06	2.50	2.66	6.1	8.17E-04
1-126 SRP	6787.05	6787.35	2.58	82.7	0.0	17.3	1.1	2.72E-05	2.52	2.70	6.5	1.13E-03
1-132 SRP	6793.25	6793.55	2.51	52.0	32.0	16.0	1.2	2.24E-05	2.45	2.65	7.5	3.66E-04
1-135 SRP	6796.15	6796.45	2.63	65.6	4.0	30.4	1.1	6.60E-05	2.61	2.70	3.5	2.41E-04
1-141 SRP	6802.20	6802.50	2.74	89.1	0.0	10.9	0.5	1.60E-05	2.69	2.83	4.9	6.56E-04
1-144 SRP	6805.20	6805.50	2.62	88.6	0.0	11.4	0.7	1.07E-05	2.56	2.73	6.1	1.20E-03
1-150 SRP	6811.15	6811.45	2.57	69.6	13.2	17.2	1.2	5.02E-05	2.51	2.69	6.7	9.90E-04
1-153 SRP	6814.10	6814.40	2.53	67.6	22.6	9.8	0.7	1.77E-05	2.47	2.65	6.9	2.53E-04
1-159 SRP	6820.20	6820.50	2.54	56.2	32.8	11.0	0.7	1.85E-05	2.48	2.66	6.7	2.94E-04
1-162 SRP	6823.20	6823.50	2.51	58.6	27.8	13.6	1.1	1.69E-05	2.45	2.65	7.8	4.22E-04
1-168 SRP	6829.05	6829.35	2.53	63.4	27.2	9.4	0.7	5.01E-05	2.47	2.65	7.0	8.66E-04
1-171 SRP	6832.20	6832.50	2.53	57.4	30.9	11.7	0.9	5.69E-05	2.47	2.66	7.3	7.59E-04
1-177 SRP	6838.20	6838.50	2.52	63.4	25.1	11.5	0.9	4.31E-05	2.46	2.66	7.6	4.67E-04
1-180 SRP	6841.20	6841.50	2.54	62.2	23.0	14.8	1.0	1.16E-05	2.48	2.67	7.1	5.11E-04
2-3 SRP	6844.40	6844.70	2.53	79.7	12.8	7.5	0.6	1.46E-05	2.46	2.66	7.7	1.07E-03
2-6 SRP	6847.50	6847.75	2.53	74.6	14.1	11.3	0.9	1.02E-05	2.46	2.66	7.6	6.49E-04
2-13 SRP	6854.55	6854.85	2.54	70.4	14.8	14.8	1.1	3.57E-05	2.48	2.67	7.1	3.02E-04
2-16 SRP	6857.60	6857.90	2.54	70.6	17.4	12.0	0.9	5.55E-05	2.47	2.68	7.6	9.05E-04
2-22 SRP	6863.50	6863.80	2.53	74.6	14.2	11.2	0.8	1.65E-05	2.46	2.66	7.6	1.07E-03
2-25 SRP	6866.50	6866.80	2.54	80.8	8.2	11.0	0.8	1.61E-05	2.47	2.67	7.5	6.12E-04
2-31 SRP	6872.55	6872.80	2.53	73.2	11.6	15.2	1.2	1.72E-05	2.45	2.67	8.0	2.97E-04
2-34 SRP	6875.60	6875.90	2.54	75.3	12.6	12.1	0.9	1.45E-05	2.47	2.67	7.7	9.21E-04
2-40 SRP	6881.30	6881.60	2.53	71.8	13.6	14.6	1.2	1.76E-05	2.47	2.67	7.9	1.12E-03
2-43 SRP	6884.45	6884.75	2.54	69.4	19.2	11.4	0.8	1.09E-05	2.47	2.67	7.4	7.88E-04
2-49 SRP	6890.50	6890.80	2.55	67.1	17.8	15.1	1.0	9.35E-06	2.49	2.67	6.8	1.08E-03
2-52 SRP	6893.25	6893.55	2.54	68.1	16.1	15.8	1.2	3.52E-05	2.48	2.67	7.3	8.86E-04
2-58 SRP	6899.50	6899.80	2.52	60.7	22.0	17.3	1.3	3.27E-05	2.46	2.66	7.7	4.13E-04
2-61 SRP	6902.55	6902.85	2.51	60.0	25.1	14.9	1.2	3.49E-05	2.44	2.65	8.0	6.23E-04
2-67 SRP	6908.60	6908.90	2.49	66.5	22.7	10.8	0.8	8.86E-06	2.42	2.61	7.4	2.02E-04
2-70 SRP	6911.30	6911.60	2.53	38.8	29.5	31.7	1.9	5.62E-05	2.49	2.66	6.1	2.78E-04
2-76 SRP	6917.50	6917.80	2.59	42.2	23.7	34.1	2.2	7.37E-05	2.55	2.72	6.4	2.55E-04
2-79 SRP	6920.55	6920.85	2.51	52.4	27.9	19.7	1.4	1.73E-05	2.45	2.64	7.2	2.57E-04
2-85 SRP	6926.55	6926.80	2.49	63.7	28.0	8.3	0.6	6.51E-06	2.43	2.62	7.2	5.72E-04
2-88 SRP	6929.45	6929.75	2.54	49.1	35.1	15.8	1.0	1.66E-05	2.49	2.66	6.4	3.49E-04
2-94 SRP	6935.45	6935.75	2.48	63.3	26.6	10.1	0.8	1.25E-05	2.41	2.62	8.1	5.19E-04
2-97 SRP	6938.55	6938.85	2.49	49.9	32.2	17.9	1.4	5.02E-05	2.43	2.64	8.0	7.79E-04
2-103 SRP	6944.70	6945.00	2.48	65.1	21.1	13.8	1.2	4.33E-05	2.40	2.62	8.5	2.69E-04
2-106 SRP	6947.55	6947.85	2.51	58.9	30.6	10.5	0.8	1.64E-05	2.44	2.63	7.4	6.36E-04
2-112 SRP	6953.55	6953.85	2.51	53.1	34.3	12.6	1.0	3.87E-05	2.45	2.65	7.6	3.43E-04
2-115 SRP	6956.30	6956.60	2.49	67.3	23.4	9.3	0.8	1.34E-05	2.42	2.63	8.1	6.49E-04
2-121 SRP	6962.60	6962.90	2.56	56.5	34.9	8.6	0.5	2.53E-05	2.50	2.66	5.7	1.00E-03
2-124 SRP	6965.40	6965.70	2.49	72.2	22.3	5.5	0.4	1.71E-05	2.41	2.62	8.2	5.56E-04
2-130 SRP	6971.70	6972.00	2.50	74.6	20.3	5.1	0.4	1.29E-05	2.42	2.63	8.1	1.23E-03
2-133 SRP	6974.55	6974.80	2.46	77.5	14.6	7.9	0.7	2.10E-05	2.38	2.60	8.7	1.65E-03
2-139 SRP	6980.65	6980.95	2.47	70.9	24.1	5.0	0.4	8.31E-06	2.39	2.60	8.0	1.07E-03
3-1 SRP	6985.35	6985.65	2.46	67.9	25.1	7.0	0.6	6.75E-06	2.38	2.60	8.4	1.13E-03
3-7 SRP	6991.30	6991.60	2.46	76.6	17.4	6.0	0.5	8.78E-06	2.38	2.60	8.8	1.40E-03
3-10 SRP	6994.30	6994.60	2.48	72.0	22.5	5.5	0.5	6.27E-06	2.38	2.64	9.6	1.25E-03
3-16 SRP	7000.25	7000.55	2.48	85.5	8.9	5.6	0.5	4.13E-06	2.38	2.63	9.5	1.43E-03
3-19 SRP	7003.00	7003.25	2.53	86.1	6.8	7.1	0.6	1.33E-05	2.45	2.65	7.8	1.29E-03
3-25 SRP	7009.10	7009.40	2.48	89.3	7.0	3.7	0.3	4.31E-06	2.39	2.63	9.3	1.55E-03
3-28 SRP	7012.30	7012.60	2.50	90.6	0.0	9.4	0.9	1.07E-05	2.40	2.66	9.8	1.34E-03
3-34 SRP	7018.25	7018.55	2.48	83.6	7.7	8.7	0.8	1.01E-05	2.39	2.63	9.4	1.21E-03
3-37 SRP	7021.20	7021.50	2.49	85.2	6.6	8.2	0.7	2.34E-05	2.40	2.64	9.1	1.45E-03



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**Summary of Routine Crushed Core Analyses Results**  
As-Received and Vacuum Dried at 212°F

Weld County, Colorado  
File no.: CO-73179  
Date: 1/27/15

Noble Energy, Inc  
Lone Pine LB19-78HN Well  
West Pony Field

Sample ID	Top Depth, feet	Bottom Depth, feet	A-R Bulk Density, gm/cc	A-R Water Saturation, % of PV	A-R Oil Saturation, % of PV	A-R Gas Saturation, % of PV	A-R Gas Saturation, % of BV	A-R Press Decay Permeability, md	Dry Bulk Density, gm/cc	Dry Grain Density, gm/cc	Dry Helium Porosity, % of BV	Dry Press Decay Permeability, md
3-43 SRP	7027.25	7027.55	2.44	68.5	25.4	6.1	0.6	8.18E-06	2.35	2.60	9.6	1.07E-03
3-46 SRP	7030.30	7030.60	2.47	79.5	11.9	8.6	0.8	1.72E-05	2.38	2.63	9.7	1.05E-03
3-52 SRP	7036.30	7036.60	2.46	77.4	15.2	7.4	0.7	1.30E-05	2.38	2.62	9.4	6.26E-04
3-55 SRP	7039.15	7039.45	2.48	77.8	14.3	7.9	0.8	1.17E-05	2.39	2.64	9.6	8.67E-04
3-61 SRP	7045.50	7045.75	2.48	80.1	7.1	12.8	1.3	3.33E-05	2.39	2.65	9.8	1.24E-03
3-64 SRP	7048.40	7048.70	2.46	78.1	10.6	11.3	1.0	1.06E-05	2.38	2.62	9.3	1.23E-03
3-70 SRP	7054.00	7054.30	2.48	82.5	8.1	9.4	0.9	1.01E-05	2.38	2.64	9.9	1.46E-03
3-73 SRP	7057.25	7057.50	2.47	83.0	8.9	8.1	0.7	1.05E-05	2.38	2.62	9.1	1.15E-03
3-79 SRP	7063.00	7063.30	2.46	79.9	10.9	9.2	0.8	2.05E-05	2.38	2.61	8.9	6.79E-04
3-82 SRP	7066.25	7066.55	2.45	79.9	14.1	6.0	0.5	5.68E-06	2.36	2.59	8.9	1.98E-04
3-88 SRP	7072.00	7072.30	2.45	71.0	22.8	6.2	0.6	7.07E-06	2.36	2.60	9.3	3.79E-04
3-91 SRP	7075.35	7075.65	2.45	76.8	16.8	6.4	0.6	7.81E-06	2.37	2.59	8.8	1.89E-04
3-97 SRP	7081.30	7081.60	2.47	78.8	14.1	7.1	0.6	6.57E-06	2.39	2.61	8.4	1.06E-04
3-100 SRP	7084.15	7084.40	2.49	78.8	16.1	5.1	0.4	2.34E-06	2.41	2.63	8.2	9.81E-05
3-106 SRP	7090.20	7090.50	2.51	81.3	12.4	6.3	0.5	4.22E-06	2.44	2.64	7.8	2.14E-04
3-109 SRP	7093.05	7093.30	2.51	81.4	13.5	5.1	0.4	4.14E-06	2.44	2.64	7.7	2.25E-04
3-115 SRP	7099.20	7099.50	2.54	93.2	3.1	3.7	0.3	3.91E-06	2.46	2.67	7.7	5.18E-04
3-118 SRP	7102.50	7102.80	2.55	85.0	12.9	2.1	0.2	1.54E-06	2.47	2.68	8.1	1.18E-03
3-124 SRP	7108.40	7108.70	2.53	97.6	0.2	2.2	0.2	1.02E-06	2.45	2.66	7.8	7.28E-04
3-127 SRP	7111.30	7111.55	2.55	98.3	0.7	1.0	0.1	1.14E-06	2.47	2.67	7.4	9.42E-04
3-145 SRP	7129.00	7129.30	2.62	97.8	0.9	1.3	0.1	5.33E-07	2.55	2.72	6.3	1.05E-03
3-151 SRP	7135.65	7135.90	2.58	97.9	0.7	1.4	0.1	1.87E-06	2.49	2.72	8.4	1.06E-03
3-154 SRP	7138.00	7138.25	2.55	98.5	0.4	1.1	0.1	1.18E-06	2.46	2.71	9.4	1.21E-03
3-160 SRP	7144.00	7144.30	2.58	98.6	0.3	1.1	0.1	2.47E-06	2.48	2.73	9.2	1.16E-03
3-163 SRP	7147.00	7147.25	2.39	67.6	0.0	32.4	5.8	1.69E-04	2.26	2.74	17.8	1.47E-03
3-169 SRP	7153.00	7153.30	2.54	98.5	0.1	1.4	0.2	2.39E-06	2.43	2.73	11.0	1.11E-03
3-172 SRP	7156.00	7156.30	2.55	96.6	0.4	3.0	0.3	2.31E-06	2.44	2.73	10.7	9.96E-04
3-178 SRP	7162.00	7162.25	2.50	97.9	0.2	1.9	0.2	1.35E-06	2.38	2.69	11.4	1.10E-03
Average values:			2.53	74.0	14.1	11.9	0.9	2.01E-05	2.46	2.66	7.7	8.62E-04

As-received bulk volumes and bulk densities were determined on intact bulk sample material. The bulk material was crushed and all other analysis reported herein were conducted on the crushed material.  
The following brine & oil densities were used to calculate H2O & oil volumes respectively: 1.071g/cc & 0.816g/cc.  
Mud/Fluid type: OBM

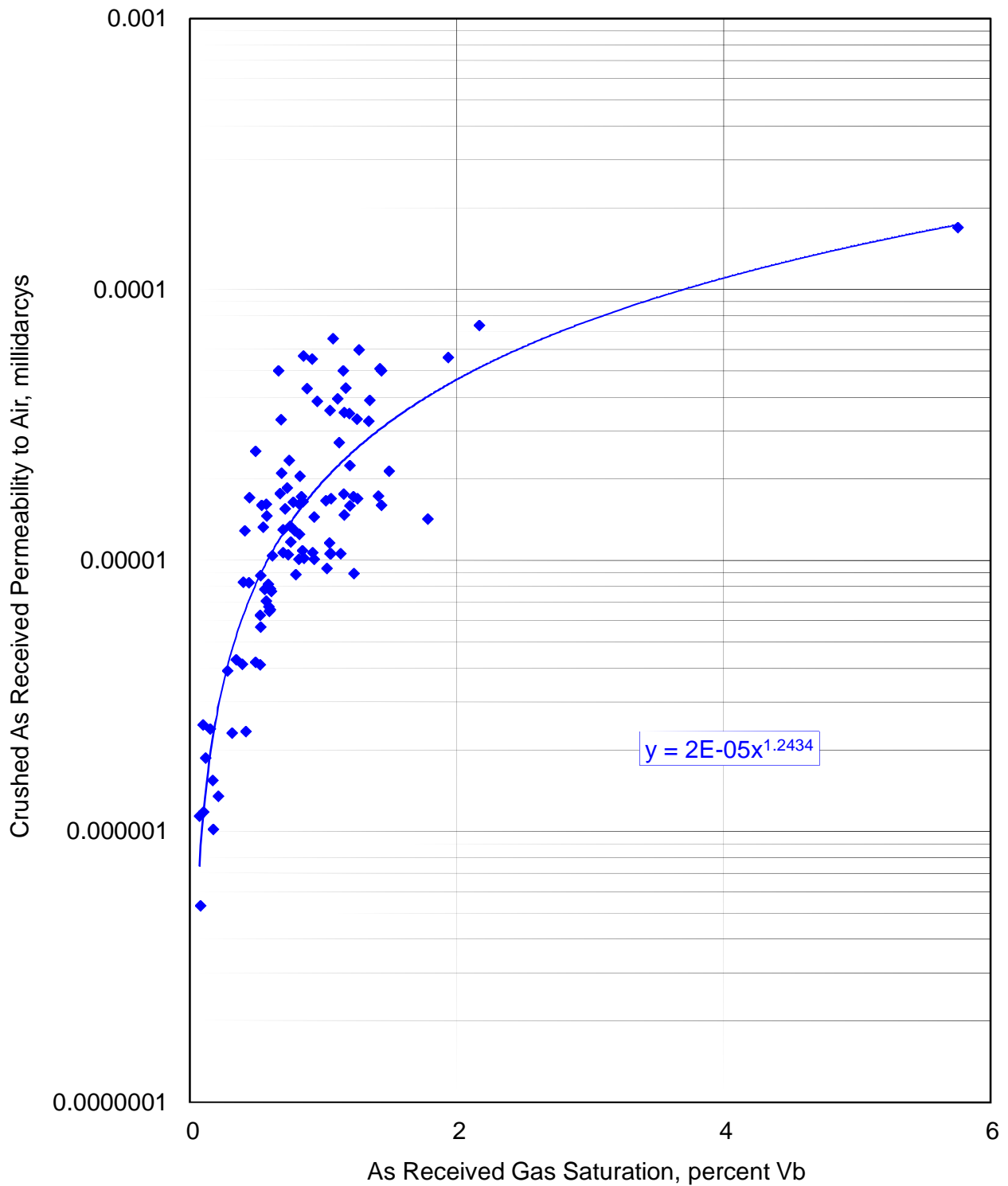


## Permeability versus Percentage Gas Saturation

As Received Crushed Preparation

Noble Energy, Inc  
Lone Pine LB19-78HN Well  
West Pony Field

Weld County, Colorado  
File no.: CO-73179  
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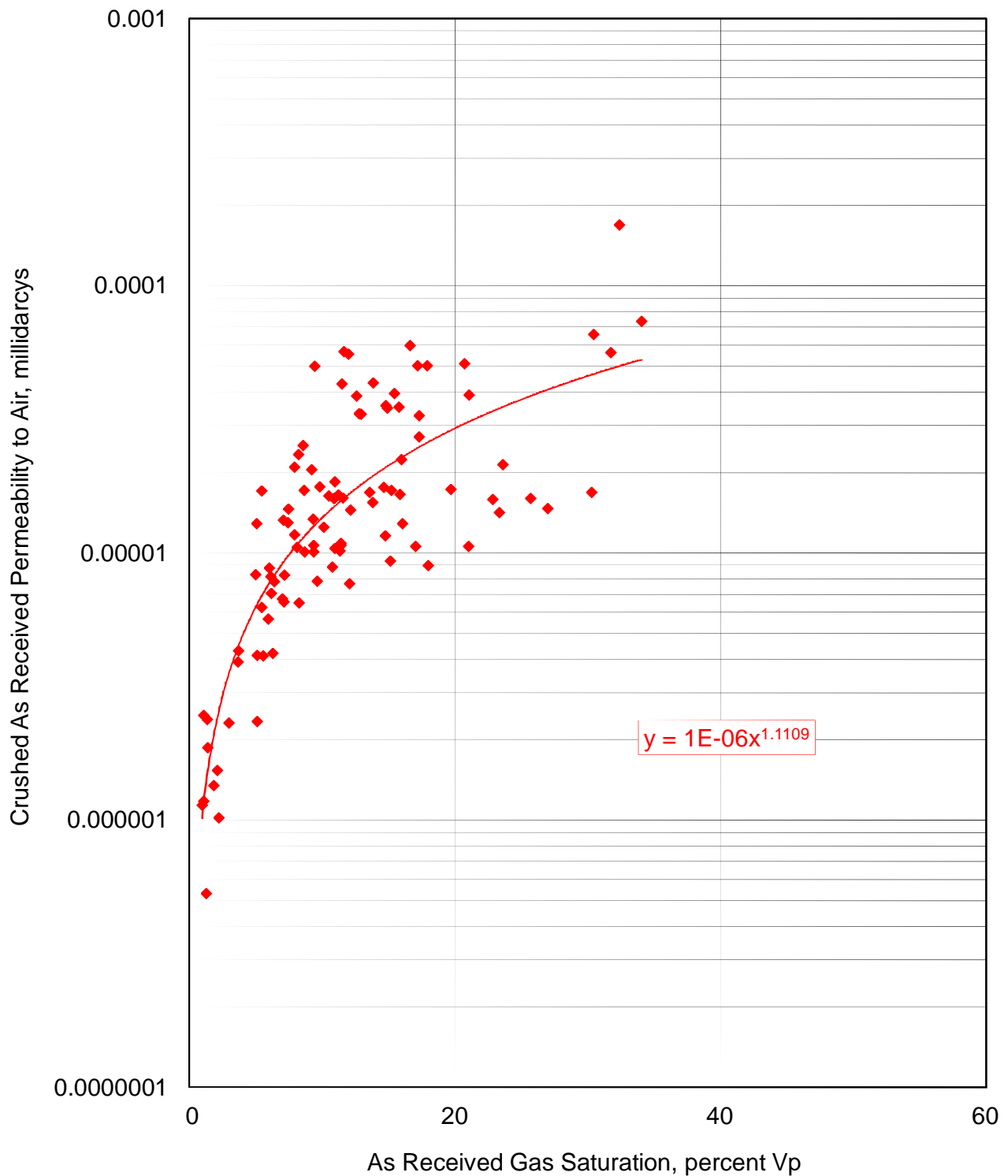


## Permeability versus Percentage Gas Saturation

As Received Crushed Preparation

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Lone Pine LB19-78HN Well  
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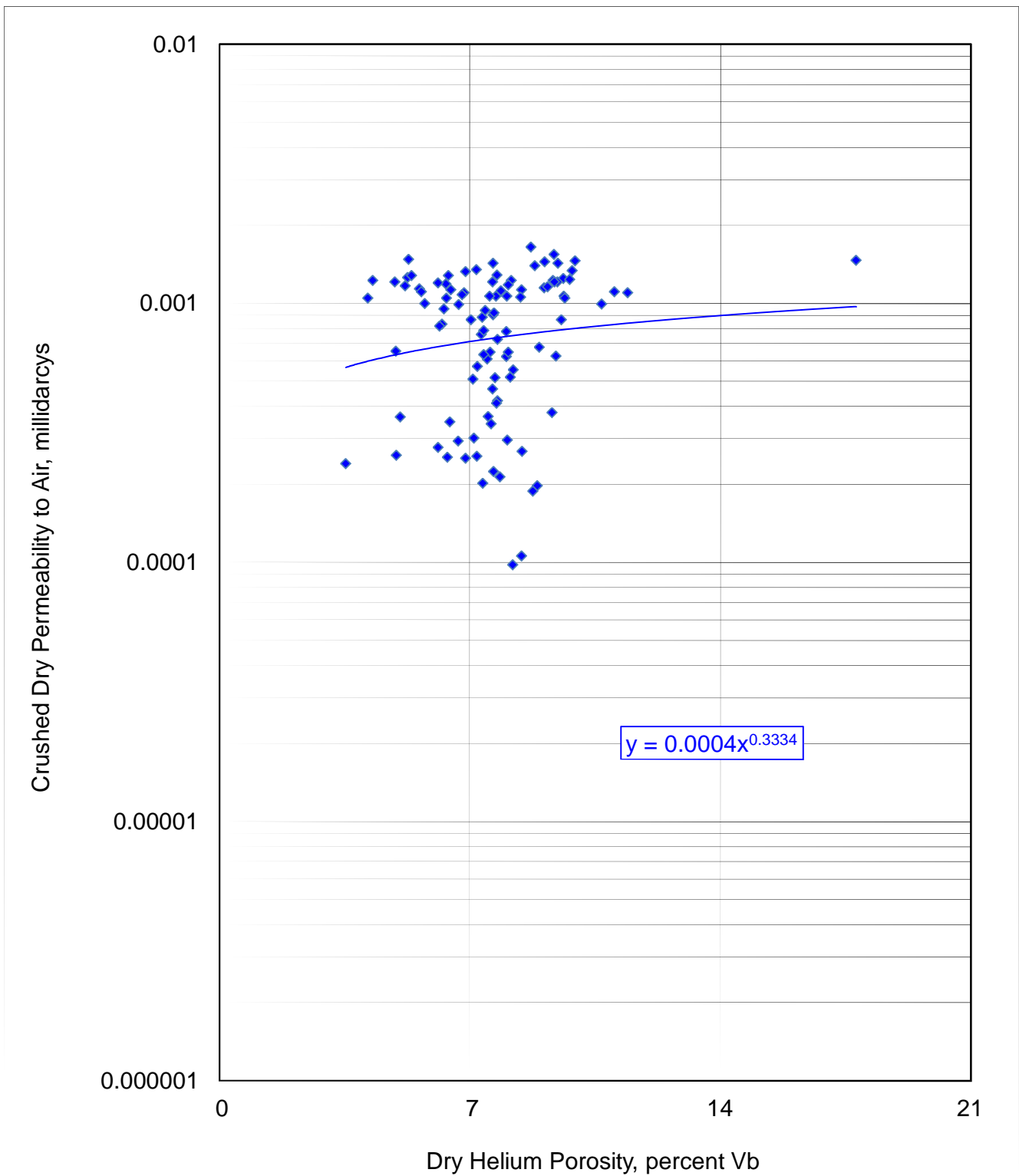


## Permeability versus Percentage Total Porosity

Dry Crushed Preparation

Noble Energy, Inc  
Lone Pine LB19-78HN Well  
West Pony Field

Weld County, Colorado  
File no.: CO-73179  
Date: 1/27/15





## Permeability versus Percentage Gas Saturation/Total Porosity

AR/Dry Crushed Preparation

Noble Energy, Inc  
Lone Pine LB19-78HN Well  
West Pony Field

Weld County, Colorado  
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