

## GPR Velocity Table and Analysis of Velocity, Dielectric Constants, Attenuation, and Conductivity Values for Materials From Various Sources

(Multiple entries reflect different references. Values  
are obtained from internet sites and other sources open to the public. This chart does not  
validate if the GPR velocity, dielectric constants, attenuation, or  
conductivity values are good representations of the material described.)

MATERIAL	DIELECTRIC CONSTANT K	CONDUCTIVITY (mS/m)	GPR VELOCITY (m/ns)	GPR VELOCITY (ft/ns)	ATTENUATION (dB/m)
Air	1	0	0.3	0.98	
Air			0.31	1.00	
Air	1	0	0.3	0.98	
Air	1	0	0.3	0.98	0
Air	1	0	0.3	0.98	0
Air	1	0			
Asphalt	3 to 5		0.173 to 0.134	0.57 to 0.44	
Asphalt			0.14	0.44	
Asphalt (dry)	3	.001 to .01			
Asphalt (wet)	9	.01 to .1			
Basalt (Wet)			0.11	0.33	
Bauxite (Dry)			0.06	0.20	
Clay (Dry)			0.15	0.50	
Clay (saturated freshwater)	8 to 12		.09 to 0.11	0.28 to 0.35	
Clay (wet)	8 to 12	100 to 1000	0.106 to 0.087	0.35 to 0.29	
Clay (Wet)			0.06	0.19	
Clay (wet)	10	100 to 1000			
Clayey Soil (dry)	2.4	0.27			
Clayey Soil (wet)	15	50			
Clays	5 to 40	2 to 1000	0.06	0.2	1 to 300
Clays	5 to 40	2 to 1000	0.06	0.2	1 to 300
Coal	4 to 5		0.15 to 0.134	0.49 to 0.44	
Coal			0.14	0.50	
Concrete	5 to 10		0.134 to 0.095	0.44 to 0.31	
Concrete (Dry)			0.13	0.44	

Concrete (dry)	7	.001 to .01			
Concrete (Wet)			0.09	0.29	
Concrete (wet)	15	0.01 to 0.1			
Dolomite	6 to 8		0.122 to 0.106	0.40 to 0.35	
Dry Salt			0.13	0.40	
Dry Salt	5 to 6	0.01 to 1	0.13	0.43	
Dry Salt	5 to 6	0.01 to 1	0.13	0.43	.01 to 1
Dry, sandy, flat coastal land	10	2	0.095	0.31	
Dry, sandy, flat coastal land	10		0.09	0.31	
Granite	4 to 6	0.01 to 1	0.13	0.43	0.01 to 1
Granite	4 to 6	0.01 to 1	0.13	0.43	0.01 to 1
Granite (dry)	5	0.00001	0.134	0.44	
Granite (Dry)			0.14	0.44	
Granite (Wet)			0.12	0.40	
Granite (wet)	7	1			
Ice			0.15	0.50	
Ice	3 to 4	0.01	0.16	0.52	
Ice	3 to 4	0.01	0.16	0.52	0.01
Ice	4	1			
Ice Fresh Water	4	0.1 to 10	0.15	0.49	
Limestone	4 to 8	0.5 to 2	0.12	0.39	0.4 to 1
Limestone	4 to 8	0.5 to 2	0.12	0.39	0.4 to 1
Limestone (dry)	7 to 9	0.000001	0.113 to 0.1	0.37 to .33	
Limestone (Dry)			0.13	0.44	
Limestone (dry)	7		0.11	0.37	
Limestone (Wet)			0.11	0.36	
Limestone (wet)	8	25			
Loamy Soil (dry)	2.5	0.11			
Loamy Soil (wet)	19	21			
Loamy/Clayey Soils (Dry)			0.19	0.67	
Mineral/Sandy Soils (Dry)			0.13	0.40	
Mixed soil components saturated	5 to 15		0.08 to 0.13	0.25 to 0.44	
Organic Soils			0.04	0.13	
Peats			0.04	0.13	
Permafrost	4 to 8	0.01 to 10	0.15 to 0.106	0.49 to 0.35	

Permafrost	6	0.01 to 10			
Permafrost Frozen Soil			0.13	0.40	
Potash Ore			0.13	0.44	
PVC, Epoxy, Polyesters, vinyls, rubber	3		0.173	0.57	
Quartz	4		0.15	0.49	
Rock (dry)	5	0.00001			
Sand & Gravel (Dry)			0.13	0.44	
Sand & Gravel Frozen			0.14	0.44	
Sand (dry)	4 to 6	0.0001 to 1	0.15 to 0.12	0.49 to 0.39	
Sand (Dry)			0.15	0.50	
Sand (Dry)	3 to 5	0.01	0.15	0.49	0.01
Sand (Dry)	3 to 5	0.01	0.15	0.49	0.01
Sand (dry)	4.5	0.0001 to 1			
Sand (dry)	4 to 6		0.12 to 0.15	0.40 to 0.49	
Sand (dry) Quartz	1.8 to 6		0.12 to 0.22	0.40 to 0.73	
Sand (saturated freshwater)	30		0.05	0.18	
Sand (wet)	25	0.1 to 1	0.055	0.18	
Sand (Wet)			0.08	0.27	
Sand (Wet)	20 to 30	0.1 to 1.0	0.06	0.2	0.03 to 0.3
Sand (wet)	25	0.1 to 10			
Sand (wet) Quartz, and kaolinite, illite and smectite clays, saturated freshwater	9 to 67		0.04 to 0.10	0.12 to 0.33	
Sand and mixed soil components, dry	2 to 6		0.12 to 0.21	0.40 to 0.69	
Sand Saturated			0.06	0.20	
Sand Saturated	20 to 30	0.1 to 1.0	0.06	0.2	0.03 to 0.3
Sandstone (Wet)			0.13	0.40	
Sandstone (wet)	6	40			
Sandy Soil (dry)	2.6	0.14			
Sandy Soil (wet)	25	6.9			
Sandy Soils (Wet)			0.06	0.21	
Sea Ice	4 to 12		0.15 to 0.087	0.49 to 0.29	
Sea Water	70	400	0.033	0.11	
Sea Water	80	3000	0.01	0.03	1000

Sea Water	80	3000	0.01	0.03	1000
Sea Water	81	4000			
Sea Water	81		0.03	0.11	
Shale	5 to 15	1 to 100	0.09	0.3	1 to 100
Shale (wet)	7	100			
Shales	5 to 15	1 to 100	0.09	0.3	1 to 100
Silt (saturated)	10		0.09	0.31	
Silt (wet)	10	1 to 10	0.095	0.31	
Silt (wet)	10	1 to 100			
Silts	5 to 30	1 to 100	0.07	0.23	1 to 100
Silts	5 to 30	1 to 100	0.07	0.23	1 to 100
Snow			0.25	0.80	
Snow	1.4	0.001 to 0.01			
Syenite Porphyry			0.13	0.40	
Tills			0.09	0.31	
Travertine			0.11	0.36	
Volcanic Ash			0.09	0.29	
Water			0.03	0.11	
Water Distilled	80	0.01	0.033	0.11	0.002
Water Distilled	80	0.01	0.033	0.11	0.002
Water Fresh	81	0.10 to 30	0.033	0.11	
Water Fresh	81		0.03	0.11	
Water Fresh	80	0.5	0.033	0.11	0.1
Water Fresh	80	0.5	0.033	0.11	0.1
Water Fresh	80	0.5			