

Appendix C.—Criteria Used in Rating Soils for Selected Uses

The following tables show the criteria used in rating soils for selected uses in tables 10, 11, 12, 13, and 14 in this survey. Soils are rated for the uses expected to be important or potentially important to users of soil survey information. Ratings for proposed uses are given in terms of limitations and restrictive features. Only the most restrictive features are listed in the tables. Therefore, if a soil is rated severe, only those soil features that cause the soil to be rated severe are given. There may be other limitations that should be overcome if the soil is to be used for a specific purpose.

The first column in the guides in this appendix shows the properties or features used as criteria for rating the soil for the use. The properties are listed in descending order of estimated importance. In the "Limits" column, limits of the properties are given for rating the soils and for recognizing a restrictive property or properties. In the "Restrictive feature" column, a key phrase indicates the feature causing the problem.

Camp Areas

Property	Limits			Restrictive feature
	Slight	Moderate	Severe	
1. USDA texture	--	--	Ice	Permafrost.
2. Flooding	None	--	Rare, common	Flooding.
3. Slope (percent)	<8	8-15	>15	Slope.
4. USDA texture modifier (surface layer)	--	STV, BYV, CB, FL	STX, BYX, CBX, FLX, CBV, FLV, CNX, CRX, SHX, SYX	Large stones.
5. Coarse fragments in the surface layer (percent) ¹	<25	25-50	>50	Small stones.
6. Depth to high water table (feet)	--	--	+	Ponding.
	>2.5	1.5-2.5	<1.5	Wetness.
7. Permeability in the upper 40 inches (in/hr) ²	>0.6	0.06-0.6	<0.06	Percs slowly.
8. USDA texture (surface layer) ²	--	--	SC, SIC, C	Too clayey.
9. Unified (surface layer)	--	--	PT	Excess humus.
10. USDA texture (surface layer)	--	LCOS, VFS, ³ LFS, ³ LS	COS, S, FS	Too sandy.
11. Depth to bedrock (inches)	--	--	<20	Depth to rock.
12. Depth to cemented pan (inches)	--	--	<20	Cemented pan.
13. USDA texture (surface layer) ⁴	--	SIL, SI, VFSL, L	--	Dusty.
14. Sodium adsorption ratio in the upper 40 inches or great group or phase	--	--	>12 (natric, halic, alkali phases)	Excess sodium.
15. Salinity in the surface layer (mmhos/cm)	<4	4-8	>8	Excess salt.
16. Soil reaction (pH in the surface layer)	--	--	<3.6	Too acid.
17. Other	--	--	⁽⁵⁾	Fragile.

¹ 100 minus percent passing No. 10 sieve.

² Rate soils in UST, TOR, ARID, BOR, or XER suborders, great groups, or subgroups one class better.

³ Rate *slight* if finer textured material is within 20 inches of the surface.

⁴ Disregard unless soil is in TOR, ARID, or XER suborders, great groups, or subgroups.

⁵ If the soil is easily damaged by use or disturbance, rate *severe—fragile*.

Picnic Areas

Property	Limits			Restrictive feature
	Slight	Moderate	Severe	
1. USDA texture	---	---	Ice	Permafrost.
2. Slope (percent)	<8	8-15	>15	Slope.
3. Flooding	None, rare, occasional	Frequent	---	Flooding.
4. Depth to high water table (feet)	---	---	+	Ponding.
	>2.5	1.0-2.5	<1.0	Wetness.
5. USDA texture modifier (surface layer)	---	STV, BYV, CB, FL	STX, BYX, CBX, FLX, CBV, FLV, CNX, CRX, SHX, SYX	Large stones.
6. USDA texture (surface layer) ¹	---	---	SC, SIC, C	Too clayey.
7. USDA texture (surface layer)	---	LCOS, VFS, ² LFS, ² LS	COS, S, FS	Too sandy.
8. Unified (surface layer)	---	---	PT	Excess humus.
9. Coarse fragments in the surface layer (percent) ³	<25	25-50	>50	Small stones.
10. Sodium adsorption ratio in the upper 40 inches or great group or phase	---	---	>12 (natric, halic, alkali phases)	Excess sodium.
11. Salinity in the surface layer (mmhos/cm)	<4	4-8	>8	Excess salt.
12. Soil reaction (pH) in the surface layer	---	---	<3.6	Too acid.
13. Permeability in the upper 40 inches (in/hr) ¹	>0.6	0.06-0.6	<0.06	Percolates slowly.
14. USDA texture (surface layer) ⁴	---	SIL, SI, VFSL, L	---	Dusty.
15. Depth to bedrock (inches)	---	---	<20	Depth to rock.
16. Depth to cemented pan (inches)	---	---	<20	Cemented pan.
17. Other	---	---	(⁵)	Fragile.

¹ Rate soils in UST, TOR, ARID, BOR, or XER suborders, great groups, or subgroups one class better.

² Rate *slight* if finer textured material is within 20 inches of the surface.

³ 100 minus percent passing No. 10 sieve.

⁴ Disregard unless soil is in TOR, ARID, or XER suborders, great groups, or subgroups.

⁵ If the soil is easily damaged by use or disturbance, rate *severe—fragile*.

Playgrounds

Property	Limits			Restrictive feature
	Slight	Moderate	Severe	
1. USDA texture	---	---	Ice	Permafrost.
2. USDA texture modifier (surface layer)	---	ST	STV, STX, BYV, BYX, CB, CBV, FL, FLV, BY, CBX, CNX, CRX, FLX, SHX, SYX	Large stones.
3. Slope (percent)	<2	2-6	>6	Slope.
4. Coarse fragments in the surface layer (percent) ¹	<10	10-25	>25	Small stones.
5. USDA texture (surface layer) ²	---	---	SC, SIC, C	Too clayey.
6. USDA texture (surface layer)	---	LCOS, VFS, ³ LFS, ³ LS	COS, S, FS	Too sandy.
7. Unified (surface layer)	---	---	PT	Excess humus.
8. Depth to high water table (feet)	---	---	+	Ponding.
	>2.5	1.5-2.5	<1.5	Wetness.
9. Flooding	None, rare	Occasional	Frequent	Flooding.
10. Depth to bedrock (inches)	>40	⁴ 20-40	<20	Depth to rock.
11. Depth to cemented pan (inches)	>40	⁴ 20-40	<20	Cemented pan.
12. Permeability in the upper 40 inches (in/hr) ²	>0.6	0.06-0.6	<0.06	Percs slowly.
13. USDA texture (surface layer) ⁵	---	SIL, SI, VFSL, L	---	Dusty.
14. Sodium adsorption ratio in the upper 40 inches or great group or phase	---	---	>12 (natric, halic, alkali phases)	Excess sodium.
15. Salinity in the surface layer (mmhos/cm)	<4	4-8	>8	Excess salt.
16. Soil reaction (pH) in the surface layer	---	---	<3.6	Too acid.
17. Other	---	---	(⁶)	Fragile.

¹ 100 minus percent passing No. 10 sieve.

² Rate soils in UST, TOR, ARID, BOR, or XER suborders, great groups, or subgroups one class better.

³ Rate *slight* if finer textured material is within 20 inches of the surface.

⁴ Rate *slight* if slopes are 0 to 2 percent.

⁵ Disregard unless soil is in TOR, ARID, or XER suborders, great groups, or subgroups.

⁶ If the soil is easily damaged by use or disturbance, rate *severe—fragile*.

Paths and Trails

Property	Limits			Restrictive feature
	Slight	Moderate	Severe	
1. USDA texture	---	---	Ice	Permafrost.
2. Fraction greater than 3 inches in the surface layer (percent by weight)	<25	25-50	>50	Large stones.
3. Depth to high water table (feet)	---	---	+	Ponding.
	>2	1-2	<1	Wetness.
4. USDA texture (surface layer) ¹	---	---	SC, SIC, C	Too clayey.
5. USDA texture (surface layer)	---	LCOS, VFS, ² LFS, ² LS	COS, S, FS	Too sandy.
6. Unified (surface layer)	---	---	PT	Excess humus.
7. Slope (percent)	<15	15-25	>25	Slope.
8. Erosion factor K (surface layer)	---	---	³ >.3	Erodes easily.
9. Coarse fragments in the surface layer (percent by weight) ⁴	---	---	>65	Small stones.
10. Flooding	None, rare, occasional	Frequent	---	Flooding.
11. USDA texture (surface layer) ⁵	---	SIL, SI, VFSL, L	---	Dusty.
12. Other	---	---	(⁶)	Fragile.

¹ Rate soils in UST, TOR, ARID, BOR, or XER suborders, great groups, or subgroups one class better.

² Rate *slight* if finer textured material is within 20 inches of the surface.

³ Disregard if slopes are 8 percent or less.

⁴ 100 minus percent passing No. 10 sieve.

⁵ Disregard unless soil is in TOR, ARID, or XER suborders, great groups, or subgroups.

⁶ If the soil is easily damaged by use or disturbance, rate *severe—fragile*.

Septic Tank Absorption Fields

Property	Limits			Restrictive feature
	Slight	Moderate	Severe	
1. USDA texture	---	---	Ice	Permafrost.
2. Total subsidence (inches)	---	---	>24	Subsides.
3. Flooding	None	Rare	Common	Flooding.
4. Depth to bedrock (inches)	>72	40-72	<40	Depth to rock.
5. Depth to cemented pan (inches)	>72	40-72	<40	Cemented pan.
6. Depth to high water table (feet)	---	---	+	Ponding.
	>6	4-6	<4	Wetness.
7. Permeability (in/hr):				
24 to 60 inches	2.0-6.0	¹ 0.6-2.0	<0.6	Percs slowly.
24 to 40 inches	---	---	>6.0	Poor filter.
8. Slope (percent)	<8	8-15	>15	Slope.
9. Fraction greater than 3 inches (percent by weight) ²	<25	25-50	>50	Large stones.
10. Downslope movement	---	---	⁽³⁾	Slippage.
11. Formation of pits	---	---	⁽⁴⁾	Pitting.

¹ Recheck to see if rating should be *slight*.

² Weighted average to 40 inches.

³ If the soil is susceptible to movement downslope when loaded, excavated, or wet, rate *severe*—*slippage*.

⁴ If the soil is susceptible to the formation of pits caused by the melting of ground ice when the ground cover is removed, rate *severe*—*pitting*.

Sewage Lagoons

Property	Limits			Restrictive feature
	Slight	Moderate	Severe	
1. USDA texture	---	---	Ice	Permafrost.
2. Permeability between 12 and 60 inches (in/hr)	<0.6	0.6-2.0	>2.0	Seepage.
3. Depth to bedrock (inches)	>60	40-60	<40	Depth to rock.
4. Depth to cemented pan	>60	40-60	<40	Cemented pan.
5. Flooding	None, rare	---	Common ¹	Flooding.
6. Slope (percent)	<2	2-7	>7	Slope.
7. Unified (any depth)	---	OL, OH	PT	Excess humus.
8. Depth to high water table (feet)	---	---	+	Ponding.
	>5	² 3.5-5	² <3.5	Wetness.
9. Fraction greater than 3 inches (percent by weight) ³	<20	20-35	>35	Large stones.
10. Downslope movement	---	---	(4)	Slippage.
11. Formation of pits	---	---	(5)	Pitting.
12. Differential settling	---	---	(6)	Unstable fill.

¹ If floodwater will not enter or damage the sewage lagoon because of low velocity and a water depth of less than 5 feet, disregard flooding.

² If the floor of the sewage lagoon has a layer at least 20 inches thick with permeability of less than 0.2 in/hr, disregard wetness.

³ Weighted average to 20 inches.

⁴ If the soil is susceptible to movement downslope when loaded, excavated, or wet, rate *severe*—*slippage*.

⁵ If the soil is susceptible to the formation of pits caused by the melting of ground ice when the ground cover is removed, rate *severe*—*pitting*.

⁶ If the soil is susceptible to differential settling, rate *severe*—*unstable fill*.

Sanitary Landfill (Trench)

Property	Limits			Restrictive feature
	Slight	Moderate	Severe	
1. USDA texture	---	---	Ice	Permafrost.
2. Flooding	None	Rare	Common	Flooding.
3. Depth to bedrock (inches)	---	---	<72	Depth to rock.
4. Depth to cemented pan (inches):				
Thick	---	---	<72	Cemented pan.
Thin	---	<72	---	Cemented pan.
5. Permeability of bottom layer (in/hr) ¹	---	---	>2.0	Seepage.
6. Depth to high water table (feet)	---	---	+	Ponding.
Apparent	---	---	<6	Wetness.
Perched	>4	2-4	<2	Wetness.
7. Slope (percent)	<8	8-15	>15	Slope.
8. USDA texture ^{1 2 3}	---	CL, SC, SICL	SIC, C	Too clayey.
9. USDA texture ³	---	LCOS, LS, LFS, LVFS	COS, S, FS, VFS, SG	Too sandy.
10. Unified ³	---	---	OL, OH, PT	Excess humus.
11. Fraction greater than 3 inches (percent by weight) ⁴	<20	20-35	>35	Large stones.
12. Sodium adsorption ratio in the upper 40 inches or great group or phase ¹	---	---	>12 (natric, halic, alkali phases)	Excess sodium.
13. Soil reaction (pH) at any depth	---	---	<3.6	Too acid.
14. Salinity at any depth (mmhos/cm)	---	---	>16	Excess salt.
15. Downslope movement	---	---	(⁵)	Slippage.
16. Differential settling	---	---	(⁶)	Unstable fill.

¹ Disregard in all Aridisols except Salorthids and Aquic subgroups, in all Aridic subgroups, and in all Torri great groups of Entisols except Aquic subgroups.

² Rate one class better if the soil is in kaolinitic family and experience confirms.

³ Thickest layer between 10 and 60 inches.

⁴ Weighted average to 60 inches.

⁵ If the soil is susceptible to movement downslope when loaded, excavated, or wet, rate *severe*—*slippage*.

⁶ If the soil is susceptible to differential settling, rate *severe*—*unstable fill*.

Sanitary Landfill (Area)

Property	Limits			Restrictive feature
	Slight	Moderate	Severe	
1. USDA texture	---	---	Ice	Permafrost.
2. Flooding	None	Rare	Common	Flooding.
3. Depth to bedrock (inches) ¹	>60	40-60	<40	Depth to rock.
4. Depth to cemented pan (inches) ¹	>60	40-60	<40	Cemented pan.
5. Permeability between 20 and 40 inches (in/hr) ¹	---	---	>2.0	Seepage.
6. Depth to high water table (feet)	---	---	+	Ponding.
Apparent	>5	3.5-5	<3.5	Wetness.
Perched	>3	1.5-3	<1.5	Wetness.
7. Slope (percent)	<8	8-15	>15	Slope.
8. Downslope movement	---	---	(2)	Slippage.
9. Formation of pits	---	---	(3)	Pitting.
10. Differential settling	---	---	(4)	Unstable fill.

¹ Disregard in all Aridisols except Salorthids and Aquic subgroups, in all Aridic subgroups, and in all Torri great groups of Entisols except Aquic subgroups.

² If the soil is susceptible to movement downslope when loaded, excavated, or wet, rate *severe—slippage*.

³ If the soil is susceptible to the formation of pits caused by the melting of ground ice when the ground cover is removed, rate *severe—pitting*.

⁴ If the soil is susceptible to differential settling, rate *severe—unstable fill*.

Daily Cover for Landfill

Property	Limits			Restrictive feature
	Good	Fair	Poor	
1. USDA texture	---	---	Ice	Permafrost.
2. Depth to bedrock (inches)	>60	40-60	<40	Depth to rock.
3. Depth to cemented pan (inches)	>60	40-60	<40	Cemented pan.
4. Unified ¹	---	---	SP, SW, SP-SM, SW-SM, GP, GW, GP-GM, GW-GM	Seepage.
5. USDA texture ^{1 2 3}	---	CL, SICL, SC	SIC, C	Too clayey.
6. USDA texture ¹	---	LCOS, LS, LFS, VFS	S, FS, COS, SG	Too sandy.
7. Unified ^{1 3}	---	---	OL, OH, CH, MH	Hard to pack.
8. Coarse fragments (percent) ^{1 4}	<25	25-50	>50	Small stones.
9. Fraction greater than 3 inches (percent by weight) ^{1 4}	<25	25-50	>50	Large stones.
10. Slope (percent)	<8	8-15	>15	Slope.
11. Depth to high water table (feet)	---	---	+	Ponding.
	>3.5	1.5-3.5	<1.5	Wetness.
12. Unified ¹	---	---	PT	Excess humus.
13. Layer thickness (inches)	>60	40-60	<40	Thin layer.
14. Soil reaction (pH) ¹	---	---	<3.6	Too acid.
15. Salinity in the upper 60 inches (mmhos/cm) ²	---	---	>16	Excess salt.
16. Sodium adsorption ratio or great group or phase ^{1 2}	---	---	>12 (halic, natric, alkali phases)	Excess sodium.
17. Carbonates	---	---	(⁵)	Excess lime.

¹ Thickest layer between 10 and 60 inches.

² Disregard in all Aridisols except Salorthids and Aquic subgroups, in all Aridic subgroups, and in all Torri great groups of Entisols except Aquic subgroups.

³ Rate one class better if the soil is in kaolinitic family and experience confirms.

⁴ 100 minus percent passing No. 10 sieve, plus fraction greater than 3 inches. Use dominant condition or restrictive feature.

⁵ If the amount of carbonate is so high that plant growth is restricted, rate *poor*—*excess lime*.

Shallow Excavations

Property	Limits			Restrictive feature
	Slight	Moderate	Severe	
1. USDA texture	---	---	Ice	Permafrost.
2. Depth to bedrock (inches):				
Hard	>60	40-60	<40	Depth to rock.
Soft	>40	20-40	<20	Depth to rock.
3. Depth to cemented pan (inches):				
Thick	>60	40-60	<40	Cemented pan.
Thin	>40	20-40	<20	Cemented pan.
4. USDA texture (20 to 60 inches)	---	¹ SI	COS, S, FS, VFS, LCOS, LS, LFS, LVFS, G, SG	Cutbanks cave.
5. USDA texture (20 to 60 inches)	---	C, SIC	---	Too clayey.
6. Soil order	---	---	Vertisols	Cutbanks cave.
7. Bulk density between depths of 20 and 60 inches (g/cc)	---	>1.8	---	Dense layer.
8. Unified (20 to 60 inches)	---	---	OL, OH, PT	Excess humus.
9. Fraction greater than 3 inches (percent by weight) ²	<25	25-50	>50	Large stones.
10. Depth to high water table (feet)				
	---	---	+	Ponding.
	>6	2.5-6	<2.5	Wetness.
11. Flooding	None, rare	Common	---	Flooding.
12. Slope (percent)	<8	8-15	>15	Slope.
13. Downslope movement	---	---	⁽³⁾	Slippage.

¹ In areas of loess, rating should be *slight*.

² Weighted average to 40 inches.

³ If the soil is susceptible to movement downslope when loaded, excavated, or wet, rate *severe*—*slippage*.

Dwellings Without Basements

Property	Limits			Restrictive feature
	Slight	Moderate	Severe	
1. USDA texture	---	---	Ice	Permafrost.
2. Total subsidence (inches)	---	---	>12	Subsides.
3. Flooding	None	---	Rare, common	Flooding.
4. Depth to high water table (feet)	---	---	+	Ponding.
	>2.5	1.5-2.5	<1.5	Wetness.
5. Shrink-swell potential ¹	Low	Moderate	High, very high	Shrink-swell.
6. Unified ¹	---	---	OL, OH, PT	Low strength.
7. Slope (percent)	<8	8-15	>15	Slope.
8. Depth to bedrock (inches):				
Hard	>40	20-40	<20	Depth to rock.
Soft	>20	<20	---	Depth to rock.
9. Depth to cemented pan (inches):				
Thick	>40	20-40	<20	Cemented pan.
Thin	>20	<20	---	Cemented pan.
10. Fraction greater than 3 inches (percent by weight) ²	<25	25-50	>50	Large stones.
11. Downslope movement	---	---	(3)	Slippage.
12. Formation of pits	---	---	(4)	Pitting.
13. Differential settling	---	---	(5)	Unstable fill.

¹ Thickest layer between 10 and 40 inches.

² Weighted average to 40 inches.

³ If the soil is susceptible to movement downslope when loaded, excavated, or wet, rate *severe*—*slippage*.

⁴ If the soil is susceptible to the formation of pits caused by the melting of ground ice when the ground cover is removed, rate *severe*—*pitting*.

⁵ If the soil is susceptible to differential settling, rate *severe*—*unstable fill*.

Dwellings With Basements

	Limits			Restrictive feature
	Slight	Moderate	Severe	
1. USDA texture	---	---	Ice	Permafrost.
2. Total subsidence (inches)	---	---	>12	Subsides.
3. Flooding	None	---	Rare, common	Flooding.
4. Depth to high water table (feet)	---	---	+	Ponding.
	>6	2.5-6	<2.5	Wetness.
5. Depth to bedrock (inches):				
Hard	>60	40-60	<40	Depth to rock.
Soft	>40	20-40	<20	Depth to rock.
6. Depth to cemented pan (inches):				
Thick	>60	40-60	<40	Cemented pan.
Thin	>40	20-40	<20	Cemented pan.
7. Slope (percent)	<8	8-15	>15	Slope.
8. Shrink-swell potential ¹	Low	Moderate	High, very high	Shrink-swell.
9. Unified (bottom layer)	---	---	OL, OH, PT	Low strength.
10. Fraction greater than 3 inches (percent by weight) ²	<25	25-50	>50	Large stones.
11. Downslope movement	---	---	(3)	Slippage.
12. Formation of pits	---	---	(4)	Pitting.
13. Differential settling	---	---	(5)	Unstable fill.

¹ Thickest layer between 10 and 60 inches.

² Weighted average to 40 inches.

³ If the soil is susceptible to movement downslope when loaded, excavated, or wet, rate *severe*—*slippage*.

⁴ If the soil is susceptible to the formation of pits caused by the melting of ground ice when the ground cover is removed, rate *severe*—*pitting*.

⁵ If the soil is susceptible to differential settling, rate *severe*—*unstable fill*.

Small Commercial Buildings

Property	Limits			Restrictive feature
	Slight	Moderate	Severe	
1. USDA texture	---	---	Ice	Permafrost.
2. Total subsidence (inches)	---	---	>12	Subsides.
3. Flooding	None	---	Rare, common	Flooding.
4. Depth to high water table (feet)	---	---	+	Ponding.
	>2.5	1.5-2.5	<1.5	Wetness.
5. Shrink-swell potential ¹	Low	Moderate	High, very high	Shrink-swell.
6. Slope (percent)	<4	4-8	>8	Slope.
7. Unified ¹	---	---	OL, OH, PT	Low strength.
8. Depth to bedrock (inches):				
Hard	>40	20-40	<20	Depth to rock.
Soft	>20	<20	---	Depth to rock.
9. Depth to cemented pan (inches):				
Thick	>40	20-40	<20	Cemented pan.
Thin	>20	<20	---	Cemented pan.
10. Fraction greater than 3 inches (percent by weight) ²	<25	25-50	>50	Large stones.
11. Downslope movement	---	---	(3)	Slippage.
12. Formation of pits	---	---	(4)	Pitting.
13. Differential settling	---	---	(5)	Unstable fill.

¹ Thickest layer between 10 and 40 inches.

² Weighted average to 40 inches.

³ If the soil is susceptible to movement downslope when loaded, excavated, or wet, rate *severe*—*slippage*.

⁴ If the soil is susceptible to the formation of pits caused by the melting of ground ice when the ground cover is removed, rate *severe*—*pitting*.

⁵ If the soil is susceptible to differential settling, rate *severe*—*unstable fill*.

Local Roads and Streets

Property	Limits			Restrictive feature
	Slight	Moderate	Severe	
1. USDA texture	---	---	Ice	Permafrost.
2. Total subsidence (inches)	---	---	>12	Subsides.
3. Depth to bedrock (inches):				
Hard	>40	20-40	<20	Depth to rock.
Soft	>20	<20	---	Depth to rock.
4. Depth to cemented pan (inches):				
Thick	>40	20-40	<20	Cemented pan.
Thin	>20	<20	---	Cemented pan.
5. Shrink-swell potential ¹	Low	Moderate	High, very high	Shrink-swell.
6. AASHTO group index number ^{1 2 3}	<5	5-8	>8	Low strength.
7. Depth to high water table (feet)	---	---	+	Ponding.
	>2.5	1.0-2.5	<1.0	Wetness.
8. Slope (percent)	<8	8-15	>15	Slope.
9. Flooding	None	Rare	Common	Flooding.
10. Potential for frost action	Low	Moderate	High	Frost action.
11. Fraction greater than 3 inches (percent by weight) ⁴	<25	25-50	>50	Large stones.
12. Downslope movement	---	---	(⁵)	Slippage.
13. Formation of pits	---	---	(⁶)	Pitting.
14. Differential settling	---	---	(⁷)	Unstable fill.

¹ Thickest layer between 10 and 40 inches.

² $GIN = (F-35)[.2 + .005(LL-40)] + .01 (F-15)(PI-10)$ where F = percent passing No. 200 sieve. If F is ≤ 35 and PI is ≥ 11 , use only part 2 of equation. Use median values.

³ Rate one class better if the soil is in a kaolinitic family and experience confirms.

⁴ Weighted average to 40 inches.

⁵ If the soil is susceptible to movement downslope when loaded, excavated, or wet, rate *severe—slippage*.

⁶ If the soil is susceptible to the formation of pits caused by the melting of ground ice when the ground cover is removed, rate *severe—pitting*.

⁷ If the soil is susceptible to differential settling, rate *severe—unstable fill*.

Lawns, Landscaping, and Golf Fairways

Property	Limits			Restrictive feature
	Slight	Moderate	Severe	
1. USDA texture	--	---	Ice	Permafrost.
2. Salinity in the surface layer (mmhos/cm)	<4	4-8	>8	Excess salt.
3. Sodium adsorption ratio in the upper 40 inches or great group or phase	--	---	>12 (halic, natric, alkali phases)	Excess sodium.
4. Soil reaction (pH) in the surface layer	--	---	>3.6	Too acid.
5. Sulfidic materials (great group)	--	---	Sulfaquents, Sulfihemists	Excess sulfur.
6. Coarse fragments in the surface layer (percent by weight) ¹	<25	25-50	>50	Small stones.
7. Fraction greater than 3 inches in the surface layer (percent by weight)	<5	5-30	>30	Large stones.
8. Depth to high water table (feet)	--	---	+	Ponding.
	>2	1-2	<1	Wetness.
9. Available water capacity (in/in) ²	>.10	.05-.10	<.05	Droughty.
10. Flooding	None, rare	Occasional	Frequent	Flooding.
11. Slope (percent)	<8	8-15	>15	Slope.
12. Depth to bedrock (inches)	>40	20-40	<20	Depth to rock.
13. Depth to cemented pan (inches)	>40	20-40	<20	Cemented pan.
14. USDA texture (surface layer) ³	--	---	SIC, C, SC	Too clayey.
15. USDA texture (surface layer)	--	---	FB, HM, MUCK, SP, MPT, PEAT	Excess humus.
16. USDA texture (surface layer)	--	LCOS, S	COS	Too sandy.
17. Carbonates	--	---	(⁴)	Excess lime.

¹ 100 minus percent passing No. 10 sieve.

² Weighted average to 40 inches.

³ Rate one class better if the soil is in a kaolinitic family and experience confirms.

⁴ If the amount of carbonate is so high that plant growth is restricted, rate *severe—excess lime*.

Roadfill

Property	Limits			Restrictive feature
	Good	Fair	Poor	
1. USDA texture	---	---	Ice	Permafrost.
2. Depth to bedrock (inches)	>60	40-60	<40	Depth to rock.
3. Depth to thick cemented pan (inches)	>60	40-60	<40	Cemented pan.
4. Shrink-swell potential ¹	Low	Moderate	High, very high	Shrink-swell.
5. AASHTO group index number ^{1 2 3}	<5	5-8	>8	Low strength.
6. Layer thickness (inches)	>60	30-60	<30	Thin layer.
7. Fraction greater than 3 inches (percent by weight) ⁴	<25	25-50	>50	Large stones.
8. Depth to high water table (feet)	>3	1-3	<1	Wetness.
9. Slope (percent)	<15	15-25	>25	Slope.
10. Content of gypsum (percent)	--	10-15	>15	Excess gypsum.

¹ Evaluate the thickest layer between 10 and 60 inches and also the bottom layer. Choose the best rating. When rating is based on the bottom layer, verify thickness.

² $GIN = (F-35)[.2 + .005(LL-40)] + .01 (F-15)(PI-10)$ where F = percent passing No. 200 sieve. If F is ≤ 35 and PI is ≥ 11 , use only part 2 of equation. Use median values.

³ Rate one class better if the soil is in a kaolinitic family and experience confirms.

⁴ Weighted average to 40 inches.

Sand

Property	Limits		Restrictive feature
	Probable source	Improbable source	
1. USDA texture	---	Ice	Permafrost.
2. Unified ¹	SW, SP, SW-SM, SP-SM	---	---
	² GW, ² GP, ² GW-GM, ² GP-GM	---	---
	---	³ GW, ³ GP, ³ GW-GM, ³ GP-GM	Small stones.
	---	PT	Excess humus.
	---	All other	Excess fines.
3. Layer thickness (inches)	>36	<36	Thin layer.
4. Fraction greater than 3 inches (percent by weight) ⁴	<50	>50	Large stones.

¹ Evaluate the thickest layer between 10 and 60 inches and also the bottom layer. Choose the best rating. When rating is based on the bottom layer, verify thickness.

² Percent passing No. 4 sieve minus percent passing No. 200 sieve is greater than 25.

³ Percent passing No. 4 sieve minus percent passing No. 200 sieve is less than 25.

⁴ Thickest layer between 10 and 60 inches.

Gravel

Property	Limits		Restrictive feature
	Probable source	Improbable source	
1. USDA texture	---	Ice	Permafrost.
2. Unified ¹	GW, GP, GW-GM, GP-GM ² SW, ² SP, ² SW-SM, ² SP-SM	--- ³ SW, ³ SP, ³ SW-SM, ³ SP-SM PT All other	--- Too sandy. Excess humus. Excess fines.
3. Layer thickness (inches)	>36	<36	Thin layer.
4. Fraction greater than 3 inches (percent by weight) ⁴	<50	>50	Large stones.

¹ Evaluate the thickest layer between 10 and 60 inches and also the bottom layer. Choose the best rating. When rating is based on the bottom layer, verify thickness.

² 100 minus percent passing No. 4 sieve is greater than 25.

³ 100 minus percent passing No. 4 sieve is less than 25.

⁴ Thickest layer between 10 and 60 inches.

Topsoil

Property	Limits			Restrictive feature
	Good	Fair	Poor	
1. USDA texture	--	---	Ice	Permafrost.
2. Depth to bedrock (inches)	>40	20-40	<20	Depth to rock.
3. Depth to cemented pan (inches)	>40	20-40	<20	Cemented pan.
4. Depth to bulk density greater than 1.8 g/cc (inches)	>40	20-40	<20	Area reclaim.
5. USDA texture ¹	--	LCOS, LS, LFS, LVFS	COS, S, FS, VFS	Too sandy.
6. USDA texture ¹	--	² SCL, ² CL, ² SICL	SIC, C, SC	Too clayey
7. USDA texture ¹	--	---	FB, HM, SP, MPT, MUCK, PEAT, CE	Excess humus.
8. Fraction greater than 3 inches (percent by weight): ³				
0 to 40 inches	<5	5-25	>25	Large stones.
40 to 60 inches	<15	15-30	>30	Area reclaim.
9. Coarse fragments (percent): ³				
0 to 40 inches	<5	5-25	>25	Small stones.
40 to 60 inches	<25	25-50	>50	Area reclaim.
10. Salinity (mmhos/cm) ¹	<4	4-8	>8	Excess salt.
11. Layer thickness (inches)	>40	20-40	<20	Thin layer.
12. Depth to high water table (feet)	--	---	<1	Wetness.
13. Sodium adsorption ratio in the upper 40 inches or great group or phase	--	---	>12 (halic, natric, alkali phases)	Excess sodium.
14. Soil reaction (pH) ¹	--	---	<3.6	Too acid.
15. Slope (percent)	<8	8-15	>15	Slope.
16. Carbonates	--	---	(⁴)	Excess lime.

¹ Thickest layer between 0 and 40 inches.

² If the soil has more than 3 percent organic matter and less than 35 percent clay, rate *good*.

³ 100 minus percent passing No. 10 sieve, plus fraction greater than 3 inches. Use dominant condition or restrictive feature.

⁴ If the amount of carbonate is so high that plant growth is restricted, rate *poor—excess lime*.

Pond Reservoir Areas

Property	Limits			Restrictive feature
	Slight	Moderate	Severe	
1. USDA texture	---	---	Ice	Permafrost.
2. Permeability between 20 and 60 inches (in/hr)	<0.6	0.6-2.0	>2.0	Seepage.
3. Depth to bedrock (inches)	>60	20-60	<20	Depth to rock.
4. Depth to cemented pan (inches)	>60	20-60	<20	Cemented pan.
5. Slope (percent)	<3	3-8	>8	Slope.
6. USDA texture (all depths)	---	---	MARL, GYP	Seepage.
7. Downslope movement	---	---	(1)	Slippage.
8. Formation of pits	---	---	(2)	Pitting.

¹ If the soil is susceptible to movement downslope when loaded, excavated, or wet, rate *severe*—*slippage*.

² If the soil is susceptible to the formation of pits caused by the melting of ground ice when the ground cover is removed, rate *severe*—*pitting*.

Embankments, Dikes, and Levees

Property	Limits			Restrictive feature
	Slight	Moderate	Severe	
1. USDA texture	--	---	Ice	Permafrost.
2. Layer thickness (inches)	>60	30-60	>30	Thin layer.
3. Unified ¹	--	---	GW, GP, SW, SP, GW-GM, GP-GM, SW-SM, SP-SM, ² SM, ² GM	Seepage.
4. Unified ¹	--	³ GM, ⁴ CL	⁵ ML, ⁶ SM, ⁶ SP, CL-ML	Piping.
5. Unified ¹	--	---	PT, OL, OH	Excess humus.
6. Unified ¹	--	---	MH, ⁷ CH	Hard to pack.
7. Fraction greater than 3 inches (percent by weight) ⁸	<15	15-35	>35	Large stones.
8. Depth to high water table (feet)	--	---	+	Ponding.
Apparent	>4	2-4	<2	Wetness.
Perched	>3	1-3	<1	Wetness.
9. Sodium adsorption ratio in the upper 40 inches or great group or phase	--	---	>12 (natric, halic, alkali phases)	Excess sodium.
10. Salinity at any depth (mmhos/cm)	<8	8-16	>16	Excess salt.
11. Content of gypsum (percent)	--	5-10	>10	Excess gypsum.

¹ Thickest layer between 10 and 60 inches.

² Rate *moderate* if more than 20 percent passing No. 200 sieve and *slight* if more than 30 percent passing No. 200 sieve.

³ Rate *slight* if less than 35 percent passing No. 200 sieve, less than 50 percent passing No. 40 sieve, and less than 65 percent passing No. 10 sieve. The soil must meet all three criteria before it is rated *slight*.

⁴ Rate *slight* if PI is greater than 15.

⁵ Rate *moderate* if PI is greater than 10.

⁶ Rate *moderate* if less than 70 percent passing No. 40 sieve and less than 90 percent passing No. 10 sieve, and rate *slight* if less than 60 percent passing No. 40 sieve and less than 75 percent passing No. 10 sieve.

⁷ Rate *moderate* if PI is less than 40.

⁸ Weighted average to 40 inches.

Drainage

Property	Limits	Restrictive feature ¹
1. USDA texture	Ice	Permafrost.
2. Depth to high water table (feet) ²	³ >3 +	Deep to water. Ponding.
3. Permeability in the upper 40 inches (in/hr) ...	<0.2	Percs slowly.
4. Depth to bedrock (inches)	<40	Depth to rock.
5. Depth to cemented pan (inches)	<40	Cemented pan.
6. Flooding	Common	Flooding.
7. Total subsidence	Any entry	Subsides.
8. Fraction greater than 3 inches (percent by weight) ⁴	>25	Large stones.
9. Potential for frost action	High	Frost action.
10. Slope (percent)	>3	Slope.
11. USDA texture ⁴	COS, S, FS, VFS, LCOS, LS, LFS, LVFS, SG, G	Cutbanks cave.
12. Salinity at any depth (mmhos/cm)	>8	Excess salt.
13. Sodium adsorption ratio in the upper 40 inches or great group or phase	>12 (natric, halic, alkali phases)	Excess sodium.
14. Sulfidic materials (great group)	Sulfaquents, Sulfihemists	Excess sulfur.
15. Soil reaction (pH) at any depth	<3.6	Too acid.
16. Downslope movement	(5)	Slippage.
17. Complex landscape	(6)	Complex slope.
18. Availability of outlets	(7)	Poor outlets.

¹ If the soil has no restrictive features, the rating is *favorable*.

² If the soil is deep to water, disregard other properties.

³ For irrigated areas, consider other restrictive features if the water table is between 3 and 5 feet.

⁴ Thickest layer between 10 and 60 inches.

⁵ If the soil is susceptible to movement downslope when loaded, excavated, or wet, list *slippage* as a restrictive feature.

⁶ If complex or irregular slopes cause difficulty in design, installation, or functioning of the system, list *complex slope* as a restrictive feature.

⁷ If good outlets are difficult to find, list *poor outlets* as a restrictive feature.

Irrigation

Property	Limits	Restrictive feature ¹
1. USDA texture	Ice	Permafrost.
2. Slope (percent)	>3	Slope.
3. Fraction greater than 3 inches (percent by weight) ²	>25	Large stones.
4. Depth to high water table (feet)	+ ³ <3	Ponding. Wetness.
5. Available water capacity (in/in) ²	<0.10	Droughty.
6. USDA texture (surface layer)	COS, S, FS, VFS, LCOS, LS, LFS, LVFS	Fast intake.
7. USDA texture (surface layer)	SIC, C, SC	Slow intake.
8. Wind erodibility group	1, 2, 3	Soil blowing.
9. Permeability in the upper 60 inches (in/hr) ...	<0.2	Percs slowly.
10. Depth to bedrock (inches)	<40	Depth to rock.
11. Depth to cemented pan (inches)	<40	Cemented pan.
12. Fragipan (great group)	All Fragi	Rooting depth.
13. Bulk density in the upper 40 inches (g/cc) ...	>1.7	Rooting depth.
14. Erosion factor K (surface layer)	>.35	Erodes easily.
15. Flooding	Common	Flooding.
16. Sodium adsorption ratio in the upper 40 inches or great group or phase	>12 (natric, halic, alkali phases)	Excess sodium.
17. Salinity in the upper 40 inches (mmhos/cm)	>4	Excess salt.
18. Soil reaction (pH) at any depth	<3.6	Too acid.
19. Complex landscape	(4)	Complex slope.
20. Formation of pits	(5)	Pitting.
21. Carbonates	(6)	Excess lime.

¹ If the soil has no restrictive features, the rating is *favorable*.

² Weighted average to 40 inches.

³ If depth to the water table is more than 3 feet during the growing season, disregard wetness.

⁴ If complex or irregular slopes cause difficulty in design, installation, or functioning of the system, list *complex slope* as a restrictive feature.

⁵ If the soil is susceptible to the formation of pits caused by the melting of ground ice when the ground cover is removed, list *pitting* as a restrictive feature.

⁶ If the amount of carbonate is so high that plant growth is restricted, list *excess lime* as a restrictive feature.

Terraces and Diversions

Property	Limits	Restrictive feature ¹
1. USDA texture	Ice	Permafrost.
2. Slope (percent)	>8	Slope.
3. Fraction greater than 3 inches (percent by weight) ²	>25	Large stones.
4. Depth to bedrock (inches)	<40	Depth to rock.
5. Depth to cemented pan (inches)	<40	Cemented pan.
6. Erosion factor K in the upper 40 inches	>.35	Erodes easily.
7. Depth to high water table (feet)	+ <3	Ponding. Wetness.
8. Fragipan (great group)	All Fragi	Rooting depth.
9. USDA texture ³	COS, S, FS, LS, LCOS, SG	Too sandy.
10. Wind erodibility group	1, 2, 3	Soil blowing.
11. Permeability (in/hr) ³	<0.2	Percs slowly.
12. Downslope movement	(4)	Slippage.
13. Complex landscape	(5)	Complex slope.
14. Availability of outlets	(6)	Poor outlets.
15. Content of gypsum (percent)	>5	Excess gypsum.

¹ If the soil has no restrictive features, the rating is *favorable*.

² Weighted average to 40 inches.

³ Thickest layer between 10 and 60 inches.

⁴ If the soil is susceptible to movement downslope when loaded, excavated, or wet, list *slippage* as a restrictive feature.

⁵ If complex or irregular slopes cause difficulty in design, installation, or functioning of the system, list *complex slope* as a restrictive feature.

⁶ If good outlets are difficult to find, list *poor outlets* as a restrictive feature.

Grassed Waterways

Property	Limits	Restrictive feature ¹
1. USDA texture	Ice	Permafrost.
2. Moisture regime	Aridic, Torric	Too arid.
3. Fraction greater than 3 inches (percent by weight) ²	>15	Large stones.
4. Depth to high water table (feet)	<1.5	Wetness.
5. Slope (percent)	>8	Slope.
6. Salinity in the surface layer (mmhos/cm)	>4	Excess salt.
7. Sodium adsorption ratio in the upper 40 inches or great group or phase	>12 (natric, halic, alkali phases)	Excess sodium.
8. Erosion factor K in the upper 40 inches	>.35	Erodes easily.
9. Available water capacity (in/in) ²	<0.10	Droughty.
10. Depth to bedrock (inches)	<40	Depth to rock.
11. Depth to cemented pan (inches)	<40	Cemented pan.
12. Fragipan (great group)	All Fragi	Rooting depth.
13. Bulk density in the upper 40 inches (g/cc) ...	>1.7	Rooting depth.
14. Permeability in the upper 40 inches (in/hr) ...	<0.2	Percs slowly.

¹ If the soil has no restrictive features, the rating is *favorable*.

² Weighted average to 40 inches.