

Generalized description of engineering-geologic aspects of sedimentary bedrock in the Boulder quadrangle, Colorado

Engineering geology unit name and map symbol	Equivalent geologic unit (s)	Description and thickness	Other features	Topographic form and surface relief	Weathering and ancient soils	Workability	Surface drainage and erosion	Ground water	Suitability for waste disposal	Foundation stability	Slope stability	Probable earthquake stability	Use
Highly swelling claystone and siltstone ca-sa	Pierre Shale (part): (Boulders, granitic, and g. clastic) zones, including basal part of upper transition member.	Claystone, silty, and siltstone, very clay to sandy; firmly cemented, dense and hard; overconsolidated; laminated, laterally, light gray where weathered; some persistent clay minerals (calcium montmorillonite and mixed layer illite-montmorillonite) are about equally abundant; and quartz, plus minor amounts of calcite, calcite, and dolomite. About 1,000 ft thick. Contains sparse 1/4- to 2-in.-thick beds of bentonite composed mostly of calcareous concretions as much as 10 in. longest dimension.	Claystone and siltstone: PVC2 rating, 1-3-4, marginal to very critical; swell index, 2,000-3,000 per cent; PVC2 rating, 1-3-4, very critical; swell index greater than 20, very critical; swell index greater than 20, very critical; swell index greater than 20, very critical. Dip of beds: 10° E. to 20° W. Zone trough of syncline with axis trending north to south along 20th Street, Boulder.	Gently rolling alluvium and colluvium covered plains; slopes as steep as 10° along flanks of mountain front.	Where buried by surficial deposits, uppermost zone of unit typically composed of two subzones: upper, generally 1-3 ft thick, altered to yellowish-brown very stiff clay and silt (CL, ML, GI, MG); and lower subzone, generally 1-3 ft thick, composed of hard yellowish-gray, silty claystone and siltstone jointed chiefly by desiccation into small angular blocks. Where not covered by surficial deposits, upper subzone commonly removed by erosion; lower subzone as much as 15 ft thick; highly susceptible to weathering.	Excavation: easy to depth of 15 ft with most power equipment including tractor-drawn scrapers and backhoes. Compaction: easy; sleepers commonly used. Drilling: moderately easy.	Infiltration: negligible. Runoff: rapid; water may accumulate in local shallow depressions for as long as a week. Susceptibility to erosion: moderate by gully wash; high by sheet wash; moderate by v. deflation. Plowing or construction D difficult to reestablish vegetation.	Permeability: negligible in unweathered and in decomposed subzone; very low to negligible in subzone jointed by desiccation. Yield to wells: negligible; locally moderate quantities. Ground water commonly seeps along base of overlying surficial deposits, through sparse sandy beds, along fractured zones in fresh rock, and along bedding plane atop bentonite beds. Quality: hard; sulfate, iron content very high, locally oily. Use: generally not practical.	Septic systems: generally unsatisfactory; percolation generally too slow. Dump sites: generally good because excavation easy and risk moderate of pollution. Dump sites: generally good because excavation easy and risk moderate of pollution.	Very poor to fair, depending on load, foundation design, and change in moisture content after construction. Locally expands excessively, and exerts high swelling pressures when moisture content increases. Bentonite beds unsuitable; expand excessively, exert very high swell pressures, and have low shearing strength. Susceptibility to frost heave high.	Mostly good where undisturbed, and where cuts are less than 20 ft high. For faces cut perpendicular to strike of bedding, or where bedding dips away from cut, slopes cut at 1 horizontal to 1 vertical probably safe. Locally poor to hazardous for vertical or steep cuts higher than 20 ft. Stability investigation required, particularly where bedding surfaces, bentonite beds, or clay areas dip toward proposed excavation at any angle lower than that angle to which slope will be cut. State regulations require support of 45° repose in excavations.	Generally good. Locally poor at top of high cuts or on steep hillsides. Source of poor-quality imperious fill and binder material.	Source of raw material for manufacture of expanded shale for lightweight aggregate. Source of poor-quality imperious fill and binder material.
Moderately swelling claystone and shale ca-sa	Pierre Shale (part): Lower transition member through Boulders, granitic, and g. clastic zones; and Oremore Shale	Claystone and shale, silty, and minor siltstone, clayey to sandy; firmly cemented, dense and hard; overconsolidated; laminated to fissile; bedding even, persistent laterally; gray to olive gray where weathered; composed chiefly of clay minerals (mixed-layer illite-montmorillonite slightly more abundant than illite), and quartz, plus minor calcite, feldspar, and in some beds gypsum and pyrite. Map unit includes three parallel mountain front and separated by map units of different lithologies: easternmost belt about 1,800 ft thick, watermarked belt about 160 ft thick. Contains numerous 1/4- to 1-in.-thick beds of bentonite composed of abundant mixed-layer illite-montmorillonite with some bentonite beds in central zone composed chiefly of kaolinite, and sparse hard, brittle calcareous concretions as much as 10 in. longest dimension.	Claystone and shale: PVC2 rating, 1-3-4, noncritical to marginal; swell index, 1,400-2,000 per cent; PVC2 rating, 0-6-7-3, noncritical to very critical; swell index, 1,400-2,000 per cent. Dip of beds: 20° E. in northern part of mapped area; 10°-20° W. along west College Avenue, Boulder.	Same as for above.	Where buried by surficial deposits, uppermost zone of unit typically composed of two subzones: upper, generally 1-3 ft thick, altered to light gray very stiff to hard clay (CL, ML, GI, MG); and lower subzone, generally 1-3 ft thick, composed of hard claystone and shale jointed chiefly by desiccation into small conchoidal fragments. Where not covered by surficial deposits, upper subzone commonly removed by erosion; lower subzone as much as 15 ft thick; highly susceptible to weathering.	Excavation: Same as for above. Compaction: Same as for above. Drilling: Same as for above.	Infiltration: Same as for above. Runoff: Same as for above. Susceptibility to erosion: Same as for above.	Permeability: Same as for above. Yield to wells: Same as for above. Use: Same as for above.	Septic systems: Same as for above. Dump sites: Same as for above.	Poor to fair depending upon load, foundation design, and change in moisture content after construction. Generally expands moderately, and exerts moderate swelling pressures when moisture content increases. Bentonite beds unsuitable; expand excessively, exert high swell pressures, and have low shearing strength. Susceptibility to frost heave high.	Same as for above.	Same as for above.	Source of poor-quality imperious fill and binder material.
Slightly swelling claystone and shale ca-sa	Pierre Shale (part): From top of Ryegate Sandstone Member through Boulders, granitic, and g. clastic zones; and Oremore Shale	Siltstone and shale, clayey to sandy, and minor claystone and sandstone; well cemented, very dense and very hard; overconsolidated; laminated to fissile; bedding even, persistent laterally; gray to olive gray where weathered; composed chiefly of clay minerals (mixed-layer illite-montmorillonite slightly more abundant than illite), plus minor calcite, feldspar, and in some beds gypsum. Map unit includes three parallel mountain front and separated by map units of different lithologies: easternmost belt about 1,720 ft thick, central belt about 370 ft thick, westernmost belt about 330 ft thick. Contains sparse 1/8- to 5-in.-thick beds of bentonite composed chiefly of mixed-layer illite-montmorillonite and lesser amounts of illite and kaolinite, and zones of numerous hard, brittle calcareous concretions as much as 2 ft longest dimension.	Siltstone and shale: PVC2 rating, 0-1-2-8, noncritical to marginal; swell index, 1,400-2,000 per cent; PVC2 rating, 0-6-7-3, noncritical to very critical; swell index, 1,400-2,000 per cent. Dip of beds: 10°-20° E. through Fossil Canyon; 30° E. through Fossil Canyon; 10°-20° W. in easternmost belt of map unit, beds dip 10°-15° E. From syncline south of Table Mountain; east limb dips 10°-15° E.	Gently rolling alluvium and colluvium-covered plains; slopes as steep as 20° along flanks of mountain front.	Where buried by surficial deposits, uppermost zone of unit typically composed of two subzones: upper, generally 1-3 ft thick, altered to olive-gray very stiff silty clay (CL, ML, GI, MG); and lower subzone, generally 1-3 ft thick, jointed chiefly by desiccation into small conchoidal fragments of claystone and shale. Where not covered by surficial deposits, upper subzone commonly removed by erosion; lower subzone as much as 10 ft thick; moderately to highly susceptible to weathering.	Excavation: mostly easy to depth of 10 ft with power equipment including tractor-drawn scrapers and backhoes. Compaction: moderately easy; sleepers commonly used. Drilling: moderately difficult.	Infiltration: Same as for above. Runoff: Same as for above. Susceptibility to erosion: Same as for above.	Permeability: Same as for above. Yield to wells: Same as for above. Use: Same as for above.	Septic systems: Same as for above. Dump sites: Same as for above.	Generally fair. Expands slightly and exerts generally low swelling pressures when moisture content increases. Bentonite beds unsuitable; expand excessively, exert high swell pressures, and have low shearing strength. Susceptibility to frost heave moderate.	Same as for above.	Same as for above.	Same as for above.
Mostly nonswelling claystone and siltstone ca-sa	Pierre Shale (part): Boulders, granitic, and g. clastic zones; and Oremore Shale	Claystone, silty, and siltstone, very clayey; firmly cemented, dense and hard; overconsolidated; laminated to fissile; bedding even, persistent laterally; gray where weathered; composed chiefly of clay minerals (mixed-layer illite-montmorillonite slightly more abundant than illite), plus minor calcite, feldspar, and in some beds gypsum. Map unit includes three parallel mountain front and separated by map units of different lithologies: easternmost belt about 1,720 ft thick, central belt about 370 ft thick, westernmost belt about 330 ft thick. Contains sparse 1/8- to 5-in.-thick beds of bentonite composed chiefly of mixed-layer illite-montmorillonite and lesser amounts of illite and kaolinite, and zones of numerous hard, brittle calcareous concretions as much as 10 in. longest dimension.	Claystone and siltstone: PVC2 rating, 0-1-2-8, noncritical to marginal; swell index, 1,400-2,000 per cent; PVC2 rating, 0-6-7-3, noncritical to very critical; swell index, 1,400-2,000 per cent. Dip of beds: 10°-20° E. through Fossil Canyon; 30° E. through Fossil Canyon; 10°-20° W. in easternmost belt of map unit, beds dip 10°-15° E.	Gently rolling alluvium and colluvium-covered plains; slopes as steep as 20° along flanks of mountain front.	Where buried by surficial deposits, uppermost zone of unit typically composed of two subzones: upper, generally 1-3 ft thick, altered to olive-gray very stiff silty clay (CL, ML, GI, MG); and lower subzone, generally 1-3 ft thick, jointed chiefly by desiccation into small conchoidal fragments of claystone and shale. Where not covered by surficial deposits, upper subzone commonly removed by erosion; lower subzone as much as 15 ft thick; highly susceptible to weathering.	Excavation: Same as for above. Compaction: Same as for above. Drilling: Same as for above.	Infiltration: Same as for above. Runoff: Same as for above. Susceptibility to erosion: Same as for above.	Permeability: Same as for above. Yield to wells: Same as for above. Use: Same as for above.	Septic systems: Same as for above. Dump sites: Same as for above.	Generally fair to good. May in places swell slightly and exert low swelling pressures when moisture content increases. Bentonite beds unsuitable; expand excessively, exert high swell pressures, and have low shearing strength. High susceptibility to frost heave.	Same as for above.	Same as for above.	Same as for above.
Siltstone, claystone, and limestone ca-sa	Morrison Formation; Nelson Creek Formation.	Siltstone (39 percent), sandstone (39 percent), claystone (10 percent), and limestone (6 percent); moderately to well cemented. Beds laminated to massive, and of variable thickness and lateral extent; varicolored. Clay minerals in the claystone chiefly mixed-layer illite-montmorillonite and illite; in some beds kaolinite equally abundant. Some gypsum and anhydrite in lower part. As much as 300 ft thick.	Claystone: PVC2 rating, 0-1-2-8, noncritical to marginal; swell index, 1,400-2,000 per cent; PVC2 rating, 0-6-7-3, noncritical to very critical; swell index, 1,400-2,000 per cent. Dip of beds: 10°-20° E. in northern part of mapped area; 10°-20° W. to vertical, in southern part.	Western slope of hogback, maximum slope ranges from 15° to 25°.	Where naturally exposed surface of siltstone and sandstone commonly case-hardened; limestone surface roughened and pitted by varicolored. Clay minerals in the claystone commonly buried by surficial deposits, uppermost zone of unit commonly altered and weakened to depth of 2-6 ft below base of surficial deposit. Unit as whole moderately susceptible to weathering.	Excavation: moderately difficult with heavy rippers and scrapers, blasting required. Compaction: moderately difficult; hauling equipment, pneumatic and smooth-tire rollers commonly used. Drilling: moderately difficult.	Infiltration: negligible. Runoff: medium to rapid. Susceptibility to erosion: moderate to rapid. Where protected by surficial deposits, but high where claystone exposed.	Permeability: varies, probably very low to negligible. Water table: generally high. Yield to wells: not known to yield in area.	Septic systems: generally unsatisfactory; percolation generally too slow. Dump sites: generally good because excavation easy and risk moderate of pollution passing through fractures into nearby aquifers.	Light structures: generally fair to good; locally may expand and exert moderate swelling pressures because of moisture change in sparse lenses of swelling claystone or anhydrite. Heavy structures: poor; may settle unevenly because of local variations in bearing strength, or loss of gypsum by leaching.	Usually good, because most beds dip into hillside.	Good.	Source of clay for brick and tile.
Red siltstone ca	Lynx Formation (part)	Siltstone and sandstone: very fine grained, moderately to well cemented, thin-bedded, silty to sandy, laterally, reddish brown; composed chiefly of calcite, quartz, and silt with minor amounts of clay minerals (chiefly illite, some mixed-layer illite-montmorillonite), and hematite; contains veins of gypsum and anhydrite in lower part. As much as 670 ft thick.	Siltstone: PVC2 rating, 0-1-2-8, noncritical to marginal; swell index, 1,400-2,000 per cent; PVC2 rating, 0-6-7-3, noncritical to very critical; swell index, 1,400-2,000 per cent. Dip of beds: 45°-60° E. in northern part of mapped area; 10°-20° W. about 150 ft above base and between two parts of unit.	Valley along hogbacks; maximum slope ranges from 20° to 30°.	In natural exposures, moderately resistant to weathering; where buried by surficial deposits, uppermost zone of unit commonly altered and weakened to depth of 2-6 ft below base of surficial deposit.	Excavation: commonly easy to depth of 6 ft with most power equipment including tractor-drawn scrapers and backhoes. Compaction: moderately difficult; hauling equipment, pneumatic and smooth-tire rollers commonly used. Drilling: moderately difficult.	Infiltration: slow. Runoff: medium to rapid. Susceptibility to erosion: moderate to rapid. Where protected by surficial deposits, but high where claystone exposed.	Permeability: low to very low. Water table: generally varies in depth; conforms generally to slope of surface; water moves mostly along fractures parallel to bedding. Yield to wells: varies widely; generally less than 1 gpm. Encrustations on well intakes may reduce yields in time. Quality: very hard; sulfate content high. Use: estimated poor source for domestic use; good source for stock use.	Septic systems: generally unsatisfactory; percolation generally too slow. Dump sites: generally good because excavation easy and risk moderate of pollution passing through fractures into nearby aquifers.	Generally good. Poor for most structures in lower part because of possible swelling of anhydrite, or settling because of leaching of gypsum.	Mostly fair. Poor to hazardous if bedding surfaces are undercut. Rock debris may slide on dip slope.	Good.	Source of poor quality fill.
Soft sandstone sa	Strada Sandstone	Sandstone: fine to very fine grained, well sorted, moderately to well cemented, silty to sandy, laterally, horizontally stratified to cross laminated; beds massive; light gray to yellowish gray; composed of subangular to subrounded frosted quartz. As much as 35 ft thick.	Foram, minor aquifer: PVC2 rating, 0-1-2-8, noncritical to marginal; swell index, 1,400-2,000 per cent; PVC2 rating, 0-6-7-3, noncritical to very critical; swell index, 1,400-2,000 per cent. Dip of beds: 10°-20° E. in northern part of mapped area; 10°-20° W. about 150 ft above base and between two parts of unit.	Narrow ledge of light-colored rock parallel to hogback crest; maximum slope ranges from 20° to 30°.	In natural exposures, moderately resistant to weathering; where buried by surficial deposits, uppermost zone of unit commonly altered and weakened to depth of 2-6 ft below base of surficial deposit.	Excavation: moderately difficult with heavy tractor-drawn rippers and scrapers. Compaction: moderately difficult; hauling equipment, pneumatic and smooth-tire rollers commonly used. Drilling: moderately difficult.	Infiltration: medium to rapid. Runoff: slow. Susceptibility to erosion: moderate to rapid. Where protected by surficial deposits, but high where claystone exposed.	Permeability: medium to high. Water table: generally varies in depth; conforms generally to slope of surface; water moves mostly along fractures parallel to bedding. Yield to wells: varies widely; generally less than 1 gpm. Encrustations on well intakes may reduce yields in time. Quality: very hard; sulfate content high. Use: estimated poor source for domestic use; good source for stock use.	Septic systems: generally unsatisfactory; percolation generally too slow. Dump sites: generally good because excavation easy and risk moderate of pollution passing through fractures into nearby aquifers.	Good.	Good, because bed dips into hillside.	Good.	Possible source of alkali sand. Reported former source of fair-quality building and grinding stone.
Sandstone and siltstone ca-sa	Pierre Shale (part): Ryegate Sandstone Member	Sandstone (50 percent), and siltstone (50 percent); moderately to well cemented, silty to sandy, laterally, horizontally stratified to cross laminated; beds massive; light gray to yellowish gray; composed of subangular to subrounded frosted quartz. As much as 670 ft thick.	Siltstone: PVC2 rating, 0-1-2-8, noncritical to marginal; swell index, 1,400-2,000 per cent; PVC2 rating, 0-6-7-3, noncritical to very critical; swell index, 1,400-2,000 per cent. Dip of beds: 10°-20° E. in northern part of mapped area; 10°-20° W. about 150 ft above base and between two parts of unit.	Low ridge about 1 mile east of hogbacks; maximum slope ranges from 20° to 30°.	In natural exposures, moderately resistant to weathering; where buried by surficial deposits, uppermost zone of unit commonly altered and weakened to depth of 2-6 ft below base of surficial deposit.	Excavation: moderately difficult with heavy tractor-drawn rippers and scrapers. Compaction: moderately difficult; hauling equipment, pneumatic and smooth-tire rollers commonly used. Drilling: moderately difficult.	Infiltration: medium to rapid. Runoff: medium to rapid. Susceptibility to erosion: moderate to rapid. Where protected by surficial deposits, but high where claystone exposed.	Permeability: low. Water table: generally varies in depth; conforms generally to slope of surface; water moves mostly along fractures parallel to bedding. Yield to wells: varies widely; generally less than 1 gpm. Encrustations on well intakes may reduce yields in time. Quality: very hard; sulfate content high. Use: estimated poor source for domestic use; good source for stock use.	Septic systems: generally unsatisfactory; percolation generally too slow. Dump sites: generally good because excavation easy and risk moderate of pollution passing through fractures into nearby aquifers.	Good.	Mostly good. Poor to hazardous if bedding surfaces are undercut. Rock debris may slide on dip slope.	Good.	Source of olive-gray landscape rock.
Sandstone, siltstone, and claystone sa-sa-ca	DeSoto Group; Ryegate Sandstone Member; Lynx Formation	Sandstone (77 percent), siltstone (11 percent), and claystone (10 percent); moderately to well cemented, silty to sandy, laterally, horizontally stratified to cross laminated; beds massive; light gray to yellowish gray; composed of subangular to subrounded frosted quartz. As much as 670 ft thick.	Foram, minor aquifer: PVC2 rating, 0-1-2-8, noncritical to marginal; swell index, 1,400-2,000 per cent; PVC2 rating, 0-6-7-3, noncritical to very critical; swell index, 1,400-2,000 per cent. Dip of beds: 10°-20° E. in northern part of mapped area; 10°-20° W. about 150 ft above base and between two parts of unit.	Eastern hogback and prominent ledges.	Where naturally exposed, sandstone surface generally case-hardened; moderately to highly resistant to weathering; where buried by surficial deposits, uppermost zone of unit commonly altered and weakened to depth of 2-6 ft below base of surficial deposit.	Excavation: moderately difficult with heavy tractor-drawn rippers and scrapers. Compaction: moderately difficult; hauling equipment, pneumatic and smooth-tire rollers commonly used. Drilling: moderately difficult.	Infiltration: medium to rapid. Runoff: medium to rapid. Susceptibility to erosion: moderate to rapid. Where protected by surficial deposits, but high where claystone exposed.	Permeability: generally low to moderate. Water table: generally varies in depth; conforms generally to slope of surface; water moves mostly along fractures parallel to bedding. Yield to wells: varies widely; generally less than 1 gpm. Encrustations on well intakes may reduce yields in time. Quality: very hard; sulfate content high. Use: estimated poor source for domestic use; good source for stock use.	Septic systems: generally unsatisfactory; percolation generally too slow. Dump sites: generally good because excavation easy and risk moderate of pollution passing through fractures into nearby aquifers.	Excellent where hazard of rockfalls on dip slope absent.	Varies. Hazardous if bedding surfaces are undercut. Loose blocks and rock debris may slide on dip slope. Locally some danger of rockfalls along flanks of steep ridges and in cuts. Inspection for loose rock above building sites recommended.	Excellent.	Source of clay for brick and tile, and of buff-colored landscape "mass" rock. Local source of fair-quality riprap.
Hard sandstone sa	Lynx Sandstone	Sandstone: very fine to medium-grained, fairly well sorted, composed of subangular to rounded frosted quartz; well cemented by siliceous, cross-stratified, flaggy, in part ripple marked; light reddish brown. Includes two beds paralleling mountain front and separated by several map units each of different lithologies: eastern belt 0-20 ft thick, western belt about 250 ft.	Jointed chiefly parallel to bedding; major fracture along outcrop. Fractures close with depth. Maximum thickness of beds: 1-2 ft thick, commonly 1-3 in. thick. Dip of beds: 10°-20° E. at outcrops.	Highest ridge and prominent ledges of western hogback; flatirons along east face of same hogback.	In natural exposures, highly resistant to weathering; where buried by surficial deposits, uppermost zone of unit commonly altered and weakened to depth of 2-6 ft below base of surficial deposit.	Excavation: difficult; requires blasting. Compaction: difficult; requires heavy equipment and smooth-tire rollers commonly used. Drilling: very difficult.	Infiltration: medium to rapid. Runoff: medium to rapid. Susceptibility to erosion: moderate to rapid. Where protected by surficial deposits, but high where claystone exposed.	Permeability: generally low to moderate. Water table: generally varies in depth; conforms generally to slope of surface; water moves mostly along fractures parallel to bedding. Yield to wells: varies widely; generally less than 1 gpm. Encrustations on well intakes may reduce yields in time. Quality: very hard; sulfate content high. Use: estimated poor source for domestic use; good source for stock use.	Septic systems: generally unsatisfactory; percolation generally too slow. Dump sites: generally good because excavation easy and risk moderate of pollution passing through fractures into nearby aquifers.	Same as for above.	Same as for above.	Same as for above.	Source of good-quality building stone and riprap.
Conglomerate and siltstone ca-sa	Fountain Formation	Conglomerate (65 percent), sandstone (25 percent), and siltstone (10 percent); very fine to coarse-grained, poorly sorted, composed of subangular to rounded fragments of quartz, feldspar, mica, and clay minerals (kaolinite and mixed-layer illite-montmorillonite more abundant than illite); well cemented by siliceous, hematite, and clay; laterally, horizontally stratified to cross laminated; reddish brown to maroon. As much as 1,200 ft thick.	Massive, jointed parallel to bedding, irregularly fractured. Fractures close with depth. Maximum thickness of beds: 1-2 ft thick, commonly 1-3 in. thick. Dip of beds: 10°-20° E. at outcrops.	Lower ridges and low hogbacks along valley formed by "Red siltstone" (sa) and about 1/2 mile east of hogbacks.	In natural exposures, moderately resistant to weathering; where buried by surficial deposits, uppermost zone of unit commonly altered and weakened to depth of 2-6 ft below base of surficial deposit.	Excavation: difficult; requires blasting. Compaction: difficult; requires heavy equipment and smooth-tire rollers commonly used. Drilling: very difficult.	Infiltration: slow. Runoff: medium to rapid. Susceptibility to erosion: moderate to rapid. Where protected by surficial deposits, but high where claystone exposed.	Permeability: generally low to moderate. Water table: generally varies in depth; conforms generally to slope of surface; water moves mostly along fractures parallel to bedding. Yield to wells: varies widely; generally less than 1 gpm. Encrustations on well intakes may reduce yields in time. Quality: very hard; sulfate content high. Use: estimated poor source for domestic use; good source for stock use.	Septic systems: generally unsatisfactory; percolation generally too slow. Dump sites: generally good because excavation easy and risk moderate of pollution passing through fractures into nearby aquifers.	Excellent.	Usually good. Loose blocks and rock debris may slide on dip slope if support removed.	Excellent.	Source of pink-colored landscape "mass" rock.
Limestone sa	Ryegate Sandstone Member; Lynx Formation (part); Glenwood Limestone Member	Limestone and dolomitic siltstone: finely to coarsely crystalline, densely laminated, very hard. Map unit includes two beds paralleling mountain front and separated by many other map units of different lithologies: eastern belt, gray limestone; beds as much as 1 ft thick, smooth, even, persistent laterally, horizontally stratified to cross laminated, interbedded with silty limestone, dolomite and claystone; total thickness 1,200 ft.	Jointed chiefly parallel to bedding; possible minor fault. Rocks in eastern belt 1-2 ft thick; in western belt 1-2 ft thick; in eastern belt 1-2 ft thick; in western belt 1-2 ft thick.	Low ridges and low hogbacks along valley formed by "Red siltstone" (sa) and about 1/2 mile east of hogbacks.	In natural exposures, moderately resistant to weathering; where buried by surficial deposits, uppermost zone of unit commonly altered and weakened to depth of 2-6 ft below base of surficial deposit.	Excavation: difficult; requires blasting. Compaction: difficult; requires heavy equipment and smooth-tire rollers commonly used. Drilling: very difficult.	Infiltration: slow. Runoff: medium to rapid. Susceptibility to erosion: moderate to rapid. Where protected by surficial deposits, but high where claystone exposed.	Permeability: medium to high along fractures. Water table: varies in depth; conforms generally to slope of surface; water moves mostly along fractures parallel to bedding. Yield to wells: varies widely; generally less than 1 gpm. Encrustations on well intakes may reduce yields in time. Quality: hard; sulfate content high. Use: estimated poor source for domestic use; good source for stock use.	Septic systems: generally unsatisfactory; percolation generally too slow. Dump sites: generally good because excavation easy and risk moderate of pollution passing through fractures into nearby aquifers.	Excellent.	Generally good. Loose blocks and rock debris may slide on dip slope if support removed.	Excellent.	Western belt reported as former local source of agricultural lime. Eastern belt reported as source of fair-quality riprap.

1/For detailed discussion of stratigraphy of these ammonite zones see Bost and Cohen (1963).
2/Potential Value Change. For discussion see explanatory notes to this report and Lane (1960).
3/Unified Soil Classification (U.S. Army Corps Engineers, 1953).