Stratigraphic Column and Lithologic Descriptions
Gallatin County, Montana

Erathem	System	Series	Unit Name	Map Symbol	MBMG Geologic Source Codes	Unit Thickness (meters)	Lithology	Lithologic Description	Your Notes
Cenozoic	Quaternary		West Gallatin River Alluvium	Qwgal	110ALVM	0-100 (0-300 ft)		Unconsolidated gravel deposits interbedded with lenses and some beds of sand, silt, and clay deposited by the West Gallatin River.	
			Small Stream and Fan Alluvium	Qssf	110ALVM 110ALVF			Mixture of unconsolidated lenticular gravel, sand, silt, and clay deposited by streams smaller than the West Gallatin River.	
			Old Alluvium: Fan, pediment, stream deposits			0-100 (0-300 ft)		Similar to small stream and fan alluvium, but in high landscape position well above other alluvial deposits and sometimes more coarse grained.	
	Tertiary	Pliocene / Miocene / Oligocene	Bozeman Group (includes Sixmile Creek, Madison Valley Formation, and Renova Formation)	QTbf	120SDMS 120UDFD	0-1525 (0-5000ft)		Sixmile Creek and Madison Valley Frm: Lenticular pebble conglomerate, arkose, and cross-bedded sandstone surrounded by mudstone and siltstone. Locally volcanic ash beds. Some fine-grained ostracode-bearing limestone; less lenticular (more extensive) beds to the west. Renova Frm: Alternating sequence of fine-grained limestone, montmorillonite mudstone, siltstone, with minor sandstone, arkose, conglomerate. Local virtric ash beds.	
		Eocene	Gallatin-Absaroka Volcanics	Tv	124VLCC	0-2745 (0-9000ft)		Light to dark grayish brown andesite and basalt flows, flow breccia, debris flow deposits, and tuff.	
			unamed gravels, sands, and siltstone			0-17 (0-50ft)		Loosely consolidated conglomerate of Precambrian rock and Paleozoic and Mesozoic sedimentary rock. Matrix is poorly sorted sand and silt derived from similar rocks.	
		Paleocene	Fort Union Formation	KTf	125FRUN	0-185 (0-600ft)		Massive to thin-bedded, fine to coarse grained, slightly calcareous, andesitic greenish-gray sandstone, and massive olive -gray mudstone. Lower Conglomeratic Sandstone-massive to thin-bedded, cross-bedded fine grained to conglomeratic andesitic yellow green sandstone with interbedded siltstone and claystone. Pebbles of volcanic rock, quartzite, gneiss and limestone.	
Mesozoic	Cretaceous	Upper	Montana Group / Livingston Group / Hoppers Formation	Kh	211HPRS	460-735 (1500-2400ft)		Massive to thin-bedded, cross-bedded, poorly sorted andesitic yellow-green sandstone with interbedded claystone and siltstone. Locally conglomeratic. Contains fresh-water mollusks and wood and plant fragments.	
			Montana Group / Livingston Group / Billman Creek Formation	Kbc	211BMCK	765-915 (2500-3000ft)		Massive olive gray to grayish red claystone with interbedded fine to coarse grained andesitic sandstone. Contains fresh-water mollusks and dinosaur bones.	
			Montana Group / Livingston Group / Sedan Formation: Miner Creek Formation	Ks	211MRCK 211SLPF (Sulphur Flats)	0-915 (0-3000ft)		Sedan Formation: Olive gray to brownish gray volcaniclastic sandstones, mudstones, and minor ash-flow tuffs. Formation consists of five members:Lennep Sandstone Mbr., Mudstone Mbr., Middle Sandstone Mbr., Ash-Flow Mbr., Lower Sandstone. Miner Creek: massive tuffaceous olive-gray siltstone with interbedded fine-grained andesitic sandstone. Contains petrified wood, leaf impressions, spores, and dinosaur bones. Sulphur Flats Sandstone- massive cross-bedded poorly sorted grayish green andesitic sandstone with interbedded tuff and bentonite. Cokedale Formation: Massive to thin-bedded poorly sorted andesitic olive-gray siltstone and sandstone with interbedded conglomerate, claystone, and tuff. Thin beds of bentonite and lignite in lower part of formation. Contains petrified wood, leaf impressions, spores, fresh water mollusks, and dinosaur bones.	
			Montana Group / Livingston Group / Sedan Formation: Cokedale Formation		211CKDL				
			Eagle Sandstone	Kte	211EGLE	0-185 (0-600ft)		Light gray, thin to thick bedded, locally cross-bedded, fine to medium grained, white and black chert bearing sandstone with some intercalated carbonaceous shale and coal beds.	
			Telegraph Creek Formation		211TPCK	0-80 (0-250ft)		Medium gray, thin-bedded siltstone containing calcareous concretions and some resistant sandstone beds	
			Colorado Group / Cody Shale: Upper Shale mbr. / Eldridge Creek mbr. / Lower Shale mbr.	Kc	211CODY	15-185 (50-600ft)		Medium to dark gray and brown thin bedded shale with some beds of siltstone and sandstone, especially in middle part. Locally fossiliferous.	
			Colorado Group / Frontier Formation	Kf	211FRNR	15-70 (50-200ft)		Buff to medium gray, thin to medium bedded, fine to coarse grained arkosic sandstone, locally silty.	
			Colorado Group / Mowry Shale	Ktm	217MWRY	10-125 (30-400ft)		Grayish-brown and green shale and siltstone with some sandstone beds. Locally carbonaceous.	
			Colorado Group / Thermopolis Shale: Muddy Sandstone mbr. / Shale mbr. / Lower Sandstone mbr.		217MDDY 217TMPL	15-120 (50-380ft)		Medium gray to black shale with numerous fine to medium grained gray sandstone beds. Locally arkosic, glauconitic, or carbonaceous. Lower resistant silical cemented quartz sandstone.	
		Lower	Kootenai Formation	Kk	217KOTN	30-155 (100-500ft)		Upper interbedded fine-grained gastropod-bearing limestone interbedded with red or black mudstone. Middle red mudstone with interbedded buff to white chert bearing sandstone. Lower chert pebble conglomerate interbedded with sandstone and red mudstone locally absent.	
	Jurassic	Upper	Morrison Formation	Ju	221MRSN	30-140 (100-450ft)		Upper carbonaceous shale, variegated red, locally green, thin to thick bedded mudstone and siltstone with intercalated yellowish-brown calcareous siltstone and sandstone often in lenses. May contain dinosaur bones.	
		Lower	Ellis Group: Swift Formation		221SWFT	30 (100ft)		Yellowish-brown, medium bedded, fine-grained, calcareous, glauconitic, sandstone. Local basal chert conglomerate.	
			Ellis Group: Rierdon Formation		221RRDN	60 (200ft)		Upper calcareous mudstone and thin-bedded fine limestone, lower resistant oolitic limestone.	
			Ellis Group: Piper Formation		221PIPR			Red calcareous siltstone and limestone with lower (?) fine-grained reddish pelecypod bearing limestone and black shale	
	Permian		Phosphoria Formation	Pp	310PSPR	0-10 (0-30ft)		Pale yellowish-brown, carbonate or chert cemented sandstone, may locally contain chert and chert-cemented breccias in Southern Gallatin County near base of formation.	
	Penn.		Quadrant Formation	Pq	320QDRN	40-80 (130-250ft)		White to pinkish-gray, medium to thick-bedded (locally cross-bedded), subrounded, fine to medium-grained silica or carbonate cemented quartz sandstone;and a lower dolostone.	
			Amsden Group	Pa	320AMSD	0-60 (0-200ft)		Pale yellow to reddish-brown, medium to thick-bedded siltstone with some dolomite and impure fossiliferous limestone beds.	
	Mississippian		Big Snowy Group	Mb	331BGSN	0-80 (0-250ft)		Upper dark-gray to black, cherty, fossiliferous shale and limestone. Middle, pink-bluff, platy to massive-bedded sandstone and siltstone. Lower pink to buff dolomite and siltstone.	
			Madison Group: Mission Canyon Limestone (includes Charles Formation, collapse breccia)	Mmm	337MSNC	130-290 (430-950ft)		Light gray, massive or poorly bedded, resistant fossiliferous limestone with solution breccias at top. Locally contains chert nodules.	
			Madison Group: Lodgepole Limestone	Mml	337LDGP	185-250 (600-810ft)		Dark gray thin to medium-bedded fossiliferous, limestone. Lower medium to dark gray, thin-bedded, sparsely fossiliferous limestone with occasional chert nodules. Black shale at the base.	
	Devonian		Three Forks Formation	Dt	337TRFK	30-50 (100-150ft)		Upper gray, thin-bedded silty yellow limestone. Middle buff, medium to thick bedded, brecciated limestone. Basal, red-orange limonite-nodule shale, and siltstone.	
			Jefferson Dolomite	Dj	341JFRS	120-190 (400-620ft)		Light and dark-brown, medium to thick-bedded, fine to medium-grained, dolostone and limestone. Often petroliferous and containing stromatoporoids and amphipora. Locally contains chert nodules.	
			Maywood Formation	Dm	344MYWD	10-30 (40-90ft)		Red, yellow or brown, thin-bedded calcareous siltstone with some dolomite, trilobite-brachiopod fossil hash in lower part	
Paleozoic	Cambrian	Upper	Snowy Range Formation: Sage Pebble Conglomerate member	€ss		40-60 (120-200ft)		Yellow-brown to olive, thin to medium bedded, fine to coarse grained, commonly glauconitic and fossilerous limestone and limestone pebble conglomerate with columella magna beds at base.	
			Snowy Range Formation: Dry Creek Shale member		371DRCK	15-25 (50-80ft)		Gray-green shale with intercalated pale-orange to buff calcareous siltstone and sandstone.	
			Pilgrim Limestone	€pi	374PLGM	110-130 (360-430ft)		Dark and light-gray mottled, meduin-thick bedded, ledge-forming, oolitic limestone. Gray to yellow-brown, thin to meduim-bedded limestone with limestone-pebble conglomerate and interbedded green shale. Gray, limestone-pebble comglomeratic massive oolitic, limestone.	
		Lower	Park Shale	€p	374PARK	30-60 (100-200ft)		Gray-green and maroon shale with interbedded brown very fine grained quartz sandstone, arkosic limestone and arkosic conglomerate.	
			Meagher Limestone	€m	374MGHR	110-140 (350-450ft)		Light to dark-gray, thin-bedded, fine-grained, trilobite and brachiopod bearing mottled limestone with some inter-bedded green shale. Dark gray massive resistant limestone. Gray, thin-bedded, fine-grained, limestione with interbedded green shale. Blue and gold mottled.	
			Wolsey Shale	€w	374WLSY	50-64 (150-210ft)		Green and maroon, micaceous shale with interbedded micaceous sandstone and siltstone. Locally contains glauconitic, arkosic limestone.	
			Flathead Sandstone	€f	374FLTD	40-45 (120-140ft)		White, buff, and orange, thin- to medium-bedded, fine-to coarse-grained quartz sandstone. Locally highly feldspatic, glauconitic beds and conglomerate.	
	Precambrian		LaHood Formation (Belt)	Yl	400LHOD	0-3050 (0-10000ft)		Dark grayish-green, coarse- to very coarse-grained, poorly bedded arkose and conglomeratic arkose. Interbedded dark-gray argillite and siliceous limestone beds in northern part of area. Thickens to the north.	
			Crystalline Metamorphic	Am	400PRBL 400MMPC			Gneiss, schist, metaquartzite, marble, injection gneiss, amphibolite, numerous pegmitite dikes and veins.	

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Data adapted from: Hackett et al., 1960; Roberts, 1963; Groff, 1965; Balster, 1971; Kuenzi and Fields, 1971;Skipp and McMannis, 1971 Roberts,1972; Montagne, 1976; Skipp and McGrew, 1977; Aram, 1979; Bonnet, 1979; Balster, 1980; Hughes, 1980; Levings et al., 1981; Chadwick, 1982; Smith and Welker, 1982; Smith, 1983; Moore, 1984; Lambing et al., 1987; Custer et al., 1991; Hiza, 1994; Dyman et al., 1995; Vuke et al., 1995; Kendy and Tresch, 1996; Skipp et al., 1999.