Rock unit	Unit hame	Age	Description	Fossil	Radiometric age	Source code	Class code	Quadrangle	Rock class	NSA class	Label
Qal	Alluvium	Quaternary	Silt, sand, and gravel of stream beds, flood plains, and terraces			RB002	100	Ruby	Unconsol	100	Qs
TKi	Intrusive rocks	Late Cretaceous(?) or Early Tertiary(?)	Granite, diorite, quartz monzonite, and may include dikes of varying composition and texture, older intrusives of the greenstone complex (mi), and hornfelds zones surrounding intrusive rocks.			RB002	201	Ruby	Ign	1650	TKi
TKe	Extrusive rocks	Cretaceous or Tertiary	Basaltic, andesitic, and rhyolitic flows, tuffs, and breccias, and a few dacite flows; interbedded sandstone and shale. Flows commonly porphyritic and gently dipping. Probably greater than 500 feet thick.			RB002	202	Ruby	Ign	1603	TKvr
Ks	Shaktolik group	late Early Cretaceous to Late Cretaceous	Graywacke, shale, grit, and conglomerate. Type section on the Shaktolik River approximately 120 miles west of the Ruby quad. Thickness estimated to be more that 4800 feet along the lower Yukon River. Unit is obsolete and no longer used. On map, this area of outcrop was replaced by later mapping.	plant fossils, marine mollusks		RB002	301	Ruby	Sed	2010	Km
Ku	Ungalik conglomerate	Cretaceous	Conglomerate, grit, some graywacke. Boulders as much as 2 ft in diameter: Sorting and bedding poor. Believed to be several hundred ft thick on the Melozitna River north of the Ruby quad. Patton and Bickel estimate minimum thickness of 1200 feet. Superceded on later maps.			RB002	302	Ruby	Sed	2170	Kuc
Kc	Chert and argillite	Cretaceous	Chert and argillite with interbedded rhyolitic tuff, sandstone, and grit.	Fragmentary fossil imprint identified as small immature ammonite of Cretaceous or Jurassic type.		RB002	303	Ruby	Sed	5745	Pig
ira	Intrusive rocks	Pre-Cretaceous	Granite, monzonite and diorite altered to augen gniess and mica schist. Locally contains younger granitic dikes.			RB002	702	Ruby	Meta	9325	PzZrqs
mi	Metamorphic igneous rock	Carboniferous (?) Late Paleozoic	Greenstone, locally some gray to red chert, greenstone tuff, and graywacke. Greenstone altered from basalt, diabase, and andesite extrusives and diorite, diabase, gabbro, and pyroxenite intrusives. In Nulato quad assigned a Carboniferous(?) age. May include greenstone from older metamorphic complex.			RB002	401	Ruby	Meta	5133	JMtu
Dl	Limestone	Devonian	Dark-gray, partly recrystallized limestone carrying light-colored, crushed crinoid columns, and associated slate, shale, and fine-grained arkose. No longer on map, lumped in unit JMtu	light-colored, crushed crinoid columns		RB002	801	Ruby	Sed	6945	Ds
Ol	Limestone and dolomite	Ordovician	Dark-gray limestone and brownish-yellow dolomite. Dolomite is common near base of section. Lies unconformably on older metamorphic rocks. Massive unit overlain by thinner bedded limestone and dolomite, succeeded by the thickest beds of the series. Total thickness of 6000 to 8000 feet for the Ordovician series. Locally silicified, dolomitized, and recrystallized.			RB002	901	Ruby	Sed	7520	Ont

Rock unit	Unit hame	Age	Description	Fossil	Radiometric age	Source code	Class code	Quadrangle	Rock class	NSA class	Label
mc	Metamorphic complex	Precambrian or Paleozoic	Schist, crystalline limestone, quartzite, greenstone, slate, and phyllite. Areas of crystalline limestone mapped separately when possible as mcl.			RB002	501	Ruby	Meta	8625	PzZm
mcl	Metamorphic complex	Precambrian or Paleozoic (may contain Ordovician and Devonian)	Crystalline limestone, may include rocks of Ordovican or Devonian but generally is more recystallized than Ordovican or Devonian rocks and is associated with schists.			RB002	502	Ruby	Meta	8620	Pzrm
mca	Metamorphic complex	Precambrian or Paleozoic	In eastern part of quad, metamorphic complex mapped as two units, mca and mcb. The older unit, mca is composed of crystalline limestone and greenstone with some schist and phyllite.			RB002	504	Ruby	Meta	8601	PzZrqs
mcb	Metamorphic complex	Precambrian or Paleozoic	The younger unit, mcb, contains schist and quatzite with some crystalline limestone, slate, and greenstone.			RB002	503	Ruby	Meta	8600	YZnm
Qac	Alluvium	Quaternary	Undifferentiated alluvial, colluvial, and eolian terrace and slope deposits. Chiefly silt and very fine sand. Terrace deposits largely fluival but in part lacustrine; slope deposits primarily eolian and colluvial.	The "Palisades" along the Yukon have yielded Pleistocene vertebrate fauna including mammoth and bison remains.		MZ002□	100	Melozitna	Unconsol	100	Qs
Qfy	Younger flood-plain deposits	Quaternary	Light-gray micaceous silt. Sand and gravel along streams that drain bendrock uplands. Characterized physiographically by badrs, oxbows, meander scars, abandoned channels, and other evidence of recent flood-plain building.			MZ002□	110	Melozitna	Unconsol	100	Qs
Qms	Modified eolian sand deposits	Quaternary	Dark-yellowish-orange and light-gray, fine- to medium-grained eolian sand. Forms briad sheetlike dune field mantling older floodplain (Qfo) and alluvial terrace (Qac) deposits of the Dulbi Flats. Deposits have a strong northeast-southwest trend.			MZ002	120	Melozitna	Unconsol	100	Qs
Qfo	Older flood-plain deposits	Quaternary	Chiefly light-gray and grayish-orange micaeous silt. Locally include peat, reworked eolian sand and gravel. Deposits at or near river level but youthful flood-plain features are much modified or absent. Contact with Qfy locally gradational and poorly defined.			MZ002	130	Melozitna	Unconsol	100	Qs
Qg	Glacial drift	Quaternary	Unsorted bouldery till and isolated moraines; may include some younger solifluction deposits near valley sides.			MZ002	140	Melozitna	Unconsol	100	Qs
Ts	Sandstone, Claystone, Conglomerate, and Lignite	Tertiary	Grayish-white granule conglomerate and sandstone, reddish-brown claystone, and lignite coal. Exposed at river level at the "Palisades" along the Yukon River.	Pollen of probable Miocene age.		MZ002	200	Melozitna	Sed	640	Tcb
TKv	Volcanic rock	Tertiary to Late Cretaceous	Indian River, Takhakhdona Hills, and Dulbi River areas- light-gray to pink rhyolite tuff, welded (?) tuff, flows, and breccia. Subordinate pumice, dark vitrophyre, and obsidian. In Takhakhdona Hills also includesdark-green to black vesicular basalt flows. Big Creek- dark-green to green dacite and andesite porphyry flows and crystal tuffs. Probabaly correlative with similar flows and tuffs in Tanana and Bettles quads. Reassigned to Tertiary by Patton (1998)	Obsidian chippings and artifacts found in archeological site in NW AK may have source in obsidian occurrence north of Little Indian River.	Flows in Tanana and Bettles quads have K-Ar date of 58 m.y.	MZ002	210	Melozitna	Ign	1070	Tvr

Rock unit	Unit hame	Age	Description	Fossil	Radiometric age	Source code	Class code	Quadrangle	Rock class	NSA class	Label
Kg	Granodiorite	Late Cretaceous	Fine- to medium-grained hornblende-biotite granodiorite with subordinate quartz monzonite and quartz diorite. (Recoded NSA 2420 March, 1999, per Bill Patton.)		K-Ar date of 82.3 and 89.0 m.y. from the Dulbatna Mountain pluton and 81.5 m.y. from the Indian Mountain pluton in adjoining Hughes quad	MZ002	300	Melozitna	Ign	2420	Kgd
Kh	Hypabyssal rocks	Cretaceous	Small bodies of primarily dacite and rhyolite porphyry. These intrusives are widespread in volcanic graywacke and mudstone unit (Kgm) and in andesitic rocks (Kv).			MZ002	310	Melozitna	Ign	2210	Kve
Kqc	Quartz-pebble conglomerate	early Late Cretaceous	Small isolated patches of light-gray quartz-pebble conglomerate and quartzose sandstone. Minor intercalated with light-colored ashy tuff. Conglomerate almost wholly of quartz and quartzite clasts. Intruded and thermally altered by granodiorite (Kg)			MZ002	320	Melozitna	Sed	1990	Kqc
Ks	Sandstone, Quartz Conglomerate, shale, and siltstone	Probably Late Cretaceous	Non-marine deposits of olive-green, fine- to coarse-grained, crossbedded, quartzose sandstone and grit; quartz-pebble conglomerate, and dark micaeous shale and siltstone. Ironstone lenses and concretions. Better sorted and higher % quartz than Kgm. Probabaly correlative with Upper Cretaceous, plant-bearing nonmarine strata in Kateel River quad.	Abundant carbonized plant debris		MZ002	330	Melozitna	Sed	1941	Kss
Kc	Igneous pebble-cobble conglomerate	late Early Cretaceous (Albian) may be as young as Late Cretaceous	Massive poorly sorted conglomerate with pebble to cobble sized clasts primarily of mafic intrusive and extrusive rocks and varied colored chert. Interbedded with fine-grained to gritty (?) , dark-green to green graywacke and mudstone. grades upward into sandstone, quartz conglomerate, shale, and siltstone (Ks). In part overlies and in part laterally gradational with volcanic graywacke and mudstone (Kgm)	Indeterminate pelecypods		MZ002	340	Melozitna	Sed	2030	Kcg
Kgm	Volcanic graywacke and mudstone	late Early Cretaceous (Albian)	Dark-greenish-gray, fine-grained to gritty(?), poorly sorted graywacke composed largely of first- and second-cycle volcanic debris but locally containing abundant granitic and metamorphic rock debris. Graded bedding common, Dark gray mudstone interbeds. Some intercalated crystal tuffs. Hornfels bordering granodiorite (Kg). Age based on correlation with HU and KT quads			MZ002	350	Melozitna	Sed	2105	Kvgm
Ktg	Tuff, volcanic graywacke, and mudstone	Early Cretaceous	Volcaniclastic rocks of andesitic and dacitic composition. Crystal-lithic tuff, lithic tuff, volcanic graywacke and mudstone. Rare andesite flows. Mapped only along northern edge of this quad and in adjoining HU quad. Overlies Kv and may grad laterally into Kgm			MZ002	360	Melozitna	Ign	2320	Ktg
Km□	Quartz Monzonite	Early Cretaceous	Pinkish coarse-grained porphyritic biotite quartz monzonite. Becomes gnessic in southern part of the Melozitna pluton. Altered and slightly cataclastic in small pluton east of Gold Mountain.		K-Ar date 111 m.y. from Melozitna pluton	MZ002	370	Melozitna	Ign	2530	Kg

Rock unit	Unit hame	Age	Description	Fossil	Radiometric age	Source code	Class code	Quadrangle	Rock class	NSA class	Label
Kv	Andesitic volcanic rocks	Earliest Cretaceous (Neocomian) but may include Albian age strata	Koyukuk River- Pillow basalt and andesitic flows; andesitic tuffs, volcanic conglomerate, and breccia; chert and fine-grained cherty tuff; coquinoidal limestone composed largely of Buchia sp. Widely altered to a hard dark green hornfels. Dulbi-Melozitna Rivers- Andesitic and dacitic tuff, breccia, volcanic conglomerate and tuffaceous graywacke. Flows and hyabyssal bodies of andesite and dacite porphyry. Dark-green hornfels near Kg.	Buchia sublaevis, belemnite; Buchia cf.B. crassicollis; Buchia keyserlingi		MZ002	380	Melozitna	Ign	2330	Kve
JPb	Basalt and diabase	Permian to Jurassic.	Spilitic basalt and diabase largely altered to greenstone. Along contact with Km, altered to mafic hornfels. Probabaly correlative with similar rocks on strike to the NE in the Tanana and Bettles quads			MZ002	400	Melozitna	Ign	5140	JMab
JPu	Ultramafics	Permian to Jurassic	Small bodies of serpentinized peridotite and dunite with closely associated gabbro and anorthosite.			MZ002	410	Melozitna	Ign	5150	Jaum
Pzm	Marble	Paleozoic	Small masses of white to light-gray coarsely crystalline dolomitic and calcareous marble. Locally altered to calc-silicate hornfels			MZ002	600	Melozitna	Meta	5525	Dm
PzpCs	Pelitic schist	Paleozoic or Precambrian	Quartz-chlorite-muscovite schist and micaceous quartzite. Greenschist facies metamorphism. Subordinate micaceous quartzite and glaucophane-chlorite-muscovite schist. Unit includes many small bodies of marble, greenstone and greenschist (believed to be altered mafics).			MZ002	700	Melozitna	Meta	9325	PzZrqs
PzpCq	Quartzite	Paleozoic or Precambrian	Fine-grained, light-gray quartzite and micaceous quartzite with subordinate quartz-mica schist, marble, and calc-silicate rock. Stratigraphic relationship to PzpCs uncertain.			MZ002	710	Melozitna	Meta	8803	PzZrpg
PzpCn	Gneiss and quartzite	Paleozoic or Precambrian	Quartz-feldspar-biotite gneiss commonly garnetiferous and locally contains sillimanite. Almandine-amphibolite facies metamorphism. Some augen gneiss. Gray coarse-grained quartzite with thin layers of biotite. Subordinate quartz-mica schist, marble, and calc-silicate rock. Contacts with PzpCs and Km are gradational and indefinite. Appears to underlie PzpCs.			MZ002	720	Melozitna	Meta	8801	PzZrpg
Qal	Alluvium	Quaternary	Silt, sand and gravel of streambeds, flood plains and terraces			NL002	101	Nulato	Unconsol	100	Qs
Tki	Intrusive Rocks	early Tertiary or Late Cretaceous	Granite and some diorite. Includes numerous dikes and sills and may include hornfels zones			NL002	1650	Nulato	Ign	1655	TKg
Ks	Shaktolik group	Late Cretaceous	Graywacke, shale, grit, and conglomerate. Thickness estimated at 4800 feet. Unit obsolete, no longer shown on map.	Marine mollusks (late Early K) and plant remains (Late K)		NL002	301	Nulato	Sed	2010	Km
Ku	Ungalik conglomerate		Conglomerate, grit, some graywacke. Clasts are angular to rounded. Sorting and bedding are poor. Boulders as much as 2 feet in diameter. Type section is near the Ungalik River west of Nulato quad. Thickness believed to be at least several hundred feet. Unit superceded on later maps			NL002	302	Nulato	Sed	2170	Kuc

Rock unit	Unit hame	Age	Description	Fossil	Radiometric age	Source code	Class code	Quadrangle	Rock class	NSA class	Label
mi	Metamorphosed igneous rocks	post - Carboniferous	Greenstone, and locally some gray to red chert, dark-gray crystalline limestone, greenstone, tuff, and graywacke. Greenstone is altered basalt and diabase of probable extrusive origin and diorite, diabase, gabbro, and pyroxenite of probable intrusive origin. Does not appear on published map, later mapping shows as TrMb (Patton, written commun., 1997)			NL002	401	Nulato	Meta	5250	MzPmi
mc	Metamorphic complex	Late Precambrian or Early Paleozoic	Quartz-mica schist, quatzite-schist, mica schist, albite-chlorite schist, albite-mica schist, ottrelite-mica schist, glaucophane-mica schist, some phyllite, slate, sheared chert, and quartzite. Unit superceded.			NL002	501	Nulato	Meta	8625	PzZm
mcl	Metamorphic complex	Precambrian or Paleozoic	Recystallized limestone - superceded, see source NL003			NL002	8610	Nulato	Meta	8620	Pzrm
vr	Volcanic rocks	unknown	Chiefly basalt and andesite. Rarely rhyolite, tuff, chert, agglomerate, and breccia. Probably of several different ages. Not shown on map as this unit, rather is NSACLASS 1000 and 2330			NL002	601	Nulato	Ign	5120	MzPzi
Qa	None	Quaternary	Alluvium			OP002	101	Ophir	Unconsol	100	Qs
Qu	None	Quaternary	Undifferientiated lowland silt, sand, muck, and gravel			OP002	102	Ophir	Unconsol	100	Qs
Qt	None	Quaternary	Terrace alluvium			OP002	103	Ophir	Unconsol	100	Qs
Qc	None	Quaternary	Colluvium			OP002	104	Ophir	Unconsol	100	Qs
TKv	Volcanics	Early Tertiary and Late Cretaceous	Volcanics			OP002	201	Ophir	Ign	1600	TKv
TKc	Mafic to intermediate volcano-plutonic complexes	Early Tertiary and Late Cretaceous	Mafic to intermediate volcano-plutonic complexes			OP002	202	Ophir	Ign	1630	TKiv
TKm	None	Early Tertiary and Late Cretaceous	Monzonite			OP002	203	Ophir	Ign	1660	TKm
TKd	None	Early Tertiary and Late Cretaceous	Dikes and subvolcanic rocks			OP002	204	Ophir	Ign	1601	TKd
TMg	None	Tertiary or Late Cretaceous (Not designated on map)	Gabbro			OP002	205	Ophir	Ign	1680	TDg
Ju	Ultramafic rocks	Late Jurassic	Ultramafic rocks			OP002	301	Ophir	Ign	3498	Jtu
ph	Harzburgite tectonite of Mount Hurst	Unknown	Harzburgite tectonite of Mount Hurst; relations uncertain			OP002	401	Ophir	Ign	5191	Jium
pc	Cumulate ultramafic rocks of Mount Hurst	Unknown	Cumulate ultramafic rocks of Mount Hurst: relations uncertain			OP002	402	Ophir	Ign	5191	Jium
Ks	Sandstone, shale, and conglomerate	Late Cretaceous	Sandstone, shale, and conglomerate			OP002	501	Ophir	Sed	2020	Kme
Ku	Undifferentiated clastic rocks	Late Cretaceous	Undifferentiated clastic rocks			OP002	502	Ophir	Sed	1970	Kk
Ksc	None	Late Cretaceous	Sandstone and conglomerate			OP002	503	Ophir	Sed	1985	Kkn
Kss	Fine sandstone, siltstone, and shale	Late Cretaceous	Fine sandstone, siltstone, and shale			OP002	504	Ophir	Sed	1970	Kk
Kls	None	Late Cretaceous	Limy volcaniclastic sandstone			OP002	505	Ophir	Sed	1942	Kk
Kac	None	Late Cretaceous	Agglomerate, chert, tuff, and sandstone			OP002	506	Ophir	Ign	2260	Kvl
Kvs	None	Late Cretaceous	Volcaniclastic sandstone			OP002	507	Ophir	Sed	1907	Kvss
Ksa	None	Late Cretaceous	Sandstone			OP002	508	Ophir	Sed	1906	Ksa
Ksh	None	Late Cretaceous	Shale and siltstone			OP002	509	Ophir	Sed	1905	Ksh
Kvg	Volcanic graywacke and conglomerate	Late Cretaceous	Volcanic graywacke and conglomerate			OP002	510	Ophir	Sed	2180	Kvm
TrMs	None	Triassic, Permian, Pennsylvanian, and Mississippian	Sandstone, grit, and argillite			OP002	601	Ophir	Sed	5021	TrMis
TrMc	Chert, argillite, and volcaniclastic rocks	Triassic, Permian, Pennsylvanian, and Mississippian	Chert, argillite, and volcaniclastic rocks			OP002	602	Ophir	Sed	5112	TrMica

Rock unit	Unit hame	Age	Description	Fossil	Radiometric age	Source code	Class code	Quadrangle	Rock class	NSA class	Label
TrMb	None	Triassic, Permian, Pennsylvanian, and Mississippian	Basalt, gabbro, and chert			OP002	603	Ophir	Ign	5133	JMtu
MDl	Limestone	Mississippian to Devonian	Limestone			OP002	701	Ophir	Sed	6380	MDl
Pzc	None	Early Paleozoic	Carbonates			OP002	801	Ophir	Sed	5340	Pzrm
PzpCs	Schistose metamorphic rocks	Early Paleozoic or Late Precambrian	Schistose metamorphic rocks			OP002	802	Ophir	Meta	8601	PzZrqs
btu	Bedrock unknown	Unknown but likely Precambrian or older	type unknown; relations uncertain			OP002	9001	Ophir	Unknown	9060	pCu
PzpCs/TrMc	None	Uncertain	Map shows questionable identification of unit.			OP002	901	Ophir	Uncertain	8601	PzZrqs
pc /TrMc	None	Uncertain	Map shows questionable identification of unit.			OP002	902	Ophir	Uncertain	99	bu
Qf		Quaternary	Floodplain deposits			?	100	Kateel River	Unconsol	100	Qs
Qt	Terrace deposits	Quaternary	Terrace deposits			KT?	101	Kateel River	Unconsol	100	Qs
Qfy	Younger flood-plain deposits	Quaternary	Light-gray micaceous silt. Sand and gravel along streams that drain bedrock uplands			KT002	102	Kateel River	Unconsol	100	Qs
Qna	Nogahabara sand dunes -- active dunes	Quaternary	Active dunes. Circular body, nearly 5 mi in diameter. Entriely sand, free of vegetation cover.			KT002	110	Kateel River	Unconsol	100	Qs
Qns	Nogahabara sand dunes -- stabilized dunes	Quaternary	Scattered circular and elliptical bodies of eolian sand.			KT002	111	Kateel River	Unconsol	100	Qs
Qfo	Older floodplain deposits	Quaternary	Chiefly light-gray and grayish-orange micaceous silt. Locally includes peat, reworked eolian sand, and gravel			KT002	103	Kateel River	Unconsol	100	Qs
Qms	Modified eolian sand deposits	Quaternary	Dark-yellowish-orange and light-gray, fine- to medium-grained eolian sand. Forms broad sheet-like dune field mantling alluvial silt deposits of the Koyukuk flats and all but tops of bedrock hills in vicinity of Roundabout Mountain.			KT002	112	Kateel River	Unconsol	100	Qs
Qhs	High terrace and slope deposits	Quaternary	Light-gray and grayish-orange micaceous silt. Subordinate lenses of sand and peat.			KT002	104	Kateel River	Unconsol	100	Qs
QTb	Basalt	early Quaternary or late Tertiary	Nearly horizontal flows of vesicular olivine basalt. Flows extruded over terrain of moderate relief, ranging in elevation from 175 to over 1,600 feet.			KT002	500	Kateel River	Ign	350	QTb
Kgs	Graywacke sandstone and mudstone	Cretaceous	Poorly sorted, muddy sandstone (graywacke) interbedded with mudstone. Chiefly dark-greenish-gray to pale-olive tuffaceous and feldspathic, fine- to very coarse-grained sandstone and subordinate dark-gray mudstone. Abundant lenses of feldspar and chert grit. Description is such that unit sounds like part of Shaktolik Group.				200	Kateel River	Sed	1825	Kgw
Kgm	Graywacke sandstone and mudstone	Early Cretaceous	Chiefly medium- to dark-gray mudstone and medium-gray to dark-greenish-gray moderately to highly calcareous fine-grained sandstone.. Sandstone locally contains thin lenses of feldspar and chert grit. Mudstone commonly banded and finely cross-bedded.	Graptolites of Early Cretaceous age (Albian) age in adjoining Nulato quadrangle. Not sure what unit though (Ks on pub. map but this doesn't match)		KT002	201	Kateel River	Sed	2152	Km

Rock unit	Unit hame	Age	Description	Fossil	Radiometric age	Source code	Class code	Quadrangle	Rock class	NSA class	Label
Kn	Nonmarine shale, siltstone and sandstone	Late Cretaceous	Nonmarine deposits of drak-gray to olive-gray micaceous shale and siltstone, and light-olive-gray to yellowish-orange, fine- to coarse-grained, crossbedded sandstone. Massive sandstone beds near base of unit. Coarse detrital fraction of sandstone chiefly quartz and chert, feldspar locally abundant. North of Kateel River, sandstone contains pyroclastic material. Conglomerate lense near base of quartz and chert. Coal beds as much as 6 in thick.	Abundant, well preserved flora.		KT002	210	Kateel River	Sed	2021	Kme
Km	Marine shale and siltstone	Early Cretaceous	Littorial and offshore marine deposits of dark-gray shale and siltstone interbedded with subordinate dark-greenish-gray fine-grained sandstone in lower part and light-olive fine- to coarse-grained crossbedded sandstone in upper part. Volcanic conglomerate loccally along contact with andesitic volcanic rocks (unit KJv). Sandstone generally better sorted and more quartzose than that of units Kgm and Kgs.	Widespread occurrence of Inoceramus altiflummis (McLearn) of Early Cretaceous (Albian) age		KT002	211	Kateel River	Sed	2101	Ksse
Knm	Undifferentiated sedimentary rocks	Cretaceous	Undifferientiated units Km and Kn, western part of map.			KT002	212	Kateel River	Sed	2021	Kms
Kvg		Cretaceous	Volcanic graywacke conglomerate			?	200	Kateel River	Sed	1908	Kvg
Kvm		Cretaceous	Volcanic graywacke conglomerate and mudstone			?	201	Kateel River	Sed	1825	Kvm
Kg	Granitic rocks	Cretaceous	Granitic rocks of acidic and intermediate composition Chiefly syenite at Roundabout Mountain and albite granite on Huslia River-Derby Creek divide.			KT002	600	Kateel River	Ign	2410	Kg
KJv	Andesitic volcanic rocks	Cretaceous and Jurassic(?)	Chiefly porphyritic pyroxene andesite and trachyandesite flows, andesitic crystal and lithic tuff, and massive andesite breccia, agglomerate, and conglomerate. Commonly altered and therefore pale green. Interbedded dark-greenish-gray tuffaceous graywacke, chert, shale, and impure limestone containing Buchia. Mildly deformed and unaltered vesicular basalt and associated pyroclastic rocks along Koyukuk River near Roundabout Mt. may be of Tertiary age.	Buchia subokensis of earliest Cretaceous age in interbedded sedimentary rocks.		KT002	800	Kateel River	Ign	2330	Kve
Pzs	Limestone and schist	Paleozoic	Limestone and schist			KT002	300	Kateel River	Sed	5310	DCd
Pzl	Limestone and schist	Paleozoic	Limestone and schist			KT002	301	Kateel River	Sed	5320	Pzld
Pzls	Limestone and schist	Paleozoic	Limestone and schist			KT002	302	Kateel River	Sed	5320	Pzld
Qac	Undifferentiated alluvial, colluvial, and eolian terrace and slope deposits	Quaternary	Chiefly silt and very fine sand. Includes extensive loess deposits			MD002	105	Medfra	Unconsol	100	Qs
Qfy	Younger flood-plain deposits	Quaternary	Silt, sand, and gravel			MD002	101	Medfra	Unconsol	100	Qs
Qfo	Older flood-plain deposits	Quaternary	Largely silt and sand but probably includes abundant gravel along Tonzona River.			MD002	102	Medfra	Unconsol	100	Qs
Qms	Modified eolian sand deposits	Quaternary	Sheetlike dune fields of tan fine- to medium-grained eolian sand, locally overlain by peat and loess			MD002	103	Medfra	Unconsol	100	Qs
Qg	Glacial drift	Quaternary	Unsorted bouldery till			MD002	104	Medfra	Unconsol	100	Qs
QTg	Gravel deposits on Jones Creek	Quaternary-Tertiary	Moderately dipping gravel exposed on Jones Creek near Nixon Fork fault, approximately 25 m thick			MD002	151	Medfra	Unconsol	100	Qs

Rock unit	Unit hame	Age	Description	Fossil	Radiometric age	Source code	Class code	Quadrangle	Rock class	NSA class	Label
TKn	Volcanic rocks of the Nowitna River area	Latest Cretaceous, Earliest Tertiary	Chiefly subaerial flows of trachyandesite, basaltic andesite, and basalt. Subordinate intercalated flows and tuffs of rhyolite and dacite.		63 to 64 Ma	MD002	202	Medfra	Ign	1605	TKvi
TKnr	Volcanic rocks of the Nowitna River area -- rhyolite	Latest Cretaceous, earliest Tertiary	Altered rhyolite domes and associated rhyolitic tuff and breccia.			MD002	201	Medfra	Ign	1603	TKvr
TKc	Mafic to intermediate Volcano-plutonic complexes	Latest Cretaceous, earliest Tertiary	Altered basalt, andesite, and trachyandesite porphyry flows and hypabyssal intrusive bodies. Altered mafic and intermediate crystal and lithic tuffs. Subordinate olivine basalt and dacite flows.		K-Ar ages of 65-71 Ma	MD002	204	Medfra	Ign	1630	TKiv
TKcm	Mafic to intermediate volcano-plutonic complexes -- monzonite	Latest Cretaceous, earliest Tertiary	Small bodies of monzonite, quartz monzonite, and granodiorite			MD002	203	Medfra	Ign	1650	TKi
TKg	Granite	Latest Cretaceous, earliest Tertiary	White to light gray, fine- to coarse-grained biotite granite.		63-71 Ma	MD002	211	Medfra	Ign	1655	TKg
TKm	Monzonite	Latest Cretaceous, earliest Tertiary	Includes monzonite, quartz monzonite, quartz monzodiorite, and monzodiorite. Subordinate monzogabbro and gabbro		66-70 Ma	MD002	205	Medfra	Ign	1660	TKm
TKv	Volcanic rocks of Nixon Fork-Upper Sulukna River area	Latest Cretaceous, earliest Tertiary	Sills, dikes, flows, and plugs of rhyolite, dacite, and trachyandesite.		62-67 Ma	MD002	206	Medfra	Ign	1603	TKvr
TKs	Volcanic rocks of the Sischu Mountains	Latest Cretaceous, earliest Tertiary	Light-gray to purplish-red banded rhyolite and dacite subaerial flows and domes, locally containing interlayered breccia and tuff.		66-71 Ma	MD002	207	Medfra	Ign	1603	TKvr
TKsc	Conglomerate, sandstone, and lignite	Latest Cretaceous, earliest Tertiary	Conglomerate, sandstone, and lignite.			MD002	209	Medfra	Sed	1510	TKcg
TKsa		Latest Cretaceous, earliest Tertiary	Dike-like body of dark-brown to gray andesite porphyry.			MD002	208	Medfra	Ign	1601	TKd
TDg	Undifferentiated gabbro	Devonian to Tertiary	Sills, dikes, and small plutons of gabbro intruding rocks of early Paleozoic and preCambrian(?) age			MD002	210	Medfra	Ign	1680	TDg
Ksu	Undifferentiated shale, siltstone, and sandstone	Cretaceous, early and late [possible Permian(?)]	Chiefly dark-gray carbonaceous, largely nonfossiliferous shale, siltstone, and very fine-grained sandstone. Includes massive limestone conglomerate of uncertain age and stratigraphic affinities. Conglomerate clasts consist of Paleozoic limestone and unit may be as old as Permian.	reworked Paleozoic		MD002	301	Medfra	Sed	1970	Kk
Ksc	Sandstone and conglomerate	Late Cretaceous	Chiefly fine- to coarse-grained, greenish-gray to gray, thinly cross-bedded "salt and pepper" sandstone and quartz-chert pebble conglomerate. Poorly exposed interbeds of dark shale and siltstone.	locally abundant plants and fresh and brackish water mollusks		MD002	302	Medfra	Sed	1985	Kkn
Kss	Fine sandstone, siltstone, and shale	early Late Cretaceous (Cenomanian)	Fine- to medium-grained, dark-greenish-gray, thinly cross-bedded, fossiliferous sandstone and poorly exposed dark-gray siltstone and shale.	Inoceramus concentricus, and I. pictus		MD002	303	Medfra	Sed	1940	Kk
Kqc	Quartz-carbonate sandstone and pebbly mudstone	Early Cretaceous (Valanginian, Hauterivian, Barremian, Aptian)	Fine- to coarse-grained quartz-carbonate sandstone and conglomerate, quartzose limestone and dark-gray pebbly mudstone and siltstone.	Buchia sublevis, B. crassicolis, Cylindroteuthis, Inoceramus, Acroteuthis, Tropaeum		MD002	305	Medfra	Sed	2125	Ksm
Kvg	Volcanic graywacke and conglomerate	earliest Cretaceous	Poorly sorted fine- to coarse-grained graywacke, sandstone, grit, and pebble to cobble conglomerate composed chiefly of volcanic rock and chert detritus; interbedded dark mudstone.	Inoceramus		MD002	304	Medfra	Sed	2180	Kvm

Rock unit	Unit hame	Age	Description	Fossil	Radiometric age	Source code	Class code	Quadrangle	Rock class	NSA class	Label
JTrt	Cherty tuff, crystal and lithic tuff, and volcanic breccia	Triassic and possible early Jurassic	Dark-greenish, very fine grained cherty tuff grading into greenish-gray radiolarian chert. Fine to coarse-grained dark greenish-gray crystal and lithic tuff. Volcanic breccia and conglomerate composed of poorly sorted clasts of mafic volcanic rocks and cherty tuff in a crystal and lithic tuff matrix.	Radiolaria and conodonts		MD002	401	Medfra	Ign	3851	JTrta
Trs	Spiculite and sandy limestone	Late Triassic (Norian)	Dark-gray banded spiculite and chert, yellowish-orange-weathering sandy fossiliferous limestone and conglomerate and dark-gray shale	Monotis ochotica, M. of M. scutiformis, Halobia, Heterastridium		MD002	402	Medfra	Sed	4032	Trsl
Ps	Sandstone, sandy limestone, and conglomerate	Permian	Fine- to coarse-grained yellowish-orange-weathering sandstone, limy sandstone, siltstone, and conglomerate.	Kuvelousia, Spiriferella, Waagenoconcha		MD002	501	Medfra	Sed	6010	PDsc
PMc	Chert and limestone	Pennsylvanian and Mississippian	Chiefly greenish-gray, dark-gray to black, and red radiolarian chert.	Radiolarians		MD002	502	Medfra	Sed	6080	TrMica
TPMcl	Limestone and sandstone	Mississippian	Lenticular beds of fossiliferous limestone having subordinate beds of sandy limestone, chert grit, and arkosic sandstone.	Conodonts and foraminifera		MD002	503	Medfra	Sed	6320	MDl
DOsl	Shaly limestone	Ordovician to Middle Devonian	Dark-gray to grayish-orange finely laminated limestone and dolomitic limestone. Suborbinate laminated dolomite, dark chert, and silicous siltstone. Interpreted as deep-water facies of Osl, Od, and DSl carbonate units.	Conodonts		MD002	508	Medfra	Sed	5310	DCd
DSl	Reefy limestone and dolomite	Late Silurian, Early Devonian (Siegenian-Emsian), early Late Devonian (Frasnian)	Unit composed of a lower sequence of dolomite containing ostracodes of probable Late Silurian age, a middle sequence of mixed limestone and dolomite having favostid reefs and shelly fossils of probable Early Devonian age and an upper sequence of Amphipora-bearing dolomite and rugose coral bearing limestone	ostracodes, favostid, Ampihpora, Smithiphyllum		MD002	504	Medfra	Sed	6960	DSwc
Sls	Thin-bedded limestone	Silurian (latest Llandoverian to early Wenlockian)	Dark-gray to black platy limestone and limy shale.	graptolites		MD002	505	Medfra	Sed	6620	Spf
Od	Massive dolomite and limestone	Middle to Late Ordovician (White Rockian to Maysvillian)	Light-brown to dark-gray massive dolomite and limestone cyclically interbedded with shallow-water yellowish-orange-weathering algal and lime mudstone.	Gastropods, corals, brachiopods, ostracodes, conodonts		MD002	506	Medfra	Sed	7520	Ont
Osl	Silty limestone and siltstone	Early Ordovician	Chiefly yellowish-orange-weathering, thin-bedded, shallow-water, silty limestone and limy siltstone.	Conodonts, trilobites, gastropods, cephalopods		MD002	507	Medfra	Sed	7520	Ont
Pzc	Chert and phyllite	early Paleozoic	Banded light-gray to black sooty impure radiolarian chert, green talcy phyllite and slate, thin-bedded shaly limestone, and calcareous quartzite.			MD002	509	Medfra	Meta	7580	SCpl
PzpCq	Quartzite, grit, and argillite	early Paleozoic or preCambrian	Fine- to coarse-grained quartzite, quartz grit, quartz-feldspar grit, and argillite grading upward in to very fine grained quartzite, argillite, calcareous argillite, phyllite, and chert.			MD002	601	Medfra	Meta	8300	CZw
PzpCs	Quartzite, grit, and argillite	early Paleozoic or preCambrian	Sheared and foliated quartz and quartz-feldspar grits and quartzite intercalated with quartz-muscovite-chlorite and quartz-muscovite-biotite schists. Subordinate phyllite, thin limestone, and metachert.		276 Ma K-Ar muscovite and 421 Ma K-ar(?) hornblende on intrusion (?) to unit.	MD002	602	Medfra	Meta	8640	YZns

Rock unit	Unit hame	Age	Description	Fossil	Radiometric age	Source code	Class code	Quadrangle	Rock class	NSA class	Label
PzpCv	Metavolcanic rocks	early Paleozoic or preCambrian	Tan, light-gray, pink, and green banded fine-grained felsic volcanic rocks having well-developed foliation. Cheifly porphyry composed of large phenocrysts of embayed quartz and plagioclase in a very fine grained quartzo-feldspathic groundmass which has a distinct micaeous overprint.			MD002	603	Medfra	Meta	8700	YZnv
PzpCc	Calc-shist	early Paleozoic or preCambrian	Light to medium-gray calc-schist and thin-bedded schistose impure marble White to light-gray, fine-grained massive sandy marble. Subordinate quartz-mica schist.			MD002	604	Medfra	Meta	8610	YZnc
PzpCp	Pelitic schist	early Paleozoic or preCambrian	Chiefly pelitic and quartzose metasedimentary rocks of greenschist facies. Light-gray micaceous quartzite and greenish quartz-chlorite-muscovite schist grading into dark-gray quartz-muscovite-biotite-garnet schist. Subordinate calc schist and marble. Locally includes greenstone and greenschist metamorphic igneous rocks composed of chlorite, epidote, actinolite, and plagioclase. Also includes a small body of pink granitic gneiss		K-Ar mica ages from 274-514 Ma, correlatives as old as 921 Ma	MD002	605	Medfra	Meta	8640	YZns
Qs	Surficial deposits	Quaternary	Glacial drift of several ages, including moraines, outwash, and lake deposits; alluvium and colluvium. All mainly consist of unconsolidated gravel, sand, silt, and clay.			HE002	100	Healy	Unconsol	100	Qs
Thd	Hornblende dacite	Pliocene	Subvolcanic intrusive rocks (hornblende dacite) of Jumbo Dome		K-Ar hornblende age of 2.79 Ma	HE002	1022	Healy	Ign	1022	Thd
Tn	Nenana gravel	Pliocene and Miocene	Poorly consolidated, buff to reddish-brown, fluvial sequence of pebble- to boulder-conglomerate and coarse-grained sandstone with interbedded mudflow deposits, thin claystone layers, and local thin lignite beds.			HE002	570	Healy	Sed	570	Tn
Tcb	Coal-bearing rocks	Miocene to Eocene	Unit mostly comprises in ascending order, the Healy Creek, Sanctuary, Suntrana, Lignite Creek, and Grubstake Formations. Coal-bearing rocks comprise terrestrial cyclical sequences, having varying proportions of siltstone, claystone, mudstone, shale, generally cross-bedded and pebbly sandstone (both arkosic and quartz-rich), subbituminous coal and lignite, and minor amounts of dominantly quartz- and chert-pebble conglomerate.	Floral assemblages		HE002	645	Healy	Sed	640	Tcb
Ts	Sedimentary rocks	Miocene? to Paleocene?	Poorly consolidated, fluviatile sequence of dark-gray shale, yellowish-gray sandstone, siltstone, and pebble conglomerate (consisting of dominantly gray quartz and black chert clasts).	Indeterminate plants		HE002	500	Healy	Sed	500	Tsu
Tvv	Volcanic rocks -- volcanic flows, pyroclastic rocks, and subordinate subvolcanic intrusive rocks	Oligocene to Paleocene	Subaerial flows and associated pyroclastic rocks ranging in composition from rhyolite to basalt. Tend to be dominantly moderately altered rhyolite and basalt, but andesite, dacite, and latitie also occur		K-Ar sanidene age of 53.9 Ma on rhyolite	HE002	1000	Healy	Ign	1000	Tvu
Tvim	Volcanic rocks -- mafic subvolcanic intrusive rocks	Oligocene to Paleocene	Dikes and small hypabyssal bodies of dark-gray basalt, diabase, and subordinate andesite		K-Ar age of 54.7 Ma on basalt dike	HE002	1012	Healy	Ign	1012	Thm

Rock unit	Unit hame	Age	Description	Fossil	Radiometric age	Source code	Class code	Quadrangle	Rock class	NSA class	Label
Tvif	Volcanic rocks -- felsic subvolcanic intrusive rocks	Oligocene to Paleocene	Dikes and small hypabyssal bodies with subordinate associated pyroclastic rocks, of dominantly tan-colored, aphanitic to very fine grained, locally porphyritic rhyolite, quartz latite, latite, and dacite.		K-Ar ages ranging 32.5 to 35.2 Ma on rhyolite	HE002	1011	Healy	Ign	1011	Thf
Tfv	Fluviatile and subordinate volcanic rocks	early Eocene?	Intercalated, fluviatile, only slightly deformed sequence of conglomerate, sandstone, siltstone, and mudstone, and a few interlayed thin flows of basaltic andesite. Clasts in conglomerate contain Late Devonian conodonts.	Metasequoia occidentalis (Newberry) Chaney		HE002	880	Healy	Sed	880	Tfv
Tcv	Cantwell Formation -- volcanic rocks subunit	Paleocene	Intercalated, moderately deformed sequence of andesite, generally zeolitized basalt, rhyolite and dacite flows, dominantly felsic pyroclastic rocks, a few interbeds of sandstone and carbonaceous mudstone, and a few small bodies of related subvolcanic intrusive rocks.		K-ar Hornblende age of 64.6 Ma on dacite, basalt, andesite, and diabase ages ranging from 50.9 (>42.9 min.) to 61.0 (>62.2 min.) Ma	HE002	1140	Healy	Ign	1140	Tcv
Tcs	Cantwell Formation -- sedimentary rocks subunit	Paleocene	Fluviatile, intercalated sequence, in various proportions, of dominantly polymictic conglomerate, sandstone (including arkose), siltstone, argillite, shale, and a few thin coal beds. Locally contains thin flows and related tuff layers of mafic to intermediate composition. Conglomerate clast are of locally variable composition, indicating derivation from a number geologically different source areas.	Plant fossils of Paleocene age, including Metasequoia occidentalis (Newberry) Chaney	K-Ar biotite ages on granitic intrusions were 71.9 and 78.7 Ma, ages of dubious geologic value.	HE002	920	Healy	Sed	1920	Kcs
Tgr	Granitic rocks	Oligocene to Paleocene	Wide variety of epizonal granitic rocks, most commonly granite and grandiorite but including tonalite and quartz monzodiorite.		K-Ar ages ranging from 36.7 to 59.8 Ma	HE002	1221	Healy	Ign	1300	Tegr
Tgrv	Granitic and volcanic rocks, undivided	Oligocene to Paleocene	Extensive border zone between rocks of late Tertiary granitic pluton (unit Tgr) and slightly younger, numerous felsic dikes and small subvolcanic intrusive rocks (unit Tvv), as well as small erosional remnants of rhyolite flows capping pluton.			HE002	1210	Healy	Ign	1210	Tiv
TKgr	Granitic and hypabyssal intrusive rocks	Paleocene? and Late Cretaceous	Two small granodiorite plutons of medium-grained granodiorite		K-Ar biotite ages of 71.9 and 78.7 Ma, probably of dubious geologic meaning (very low K2O in biotite)	HE002	1655	Healy	Ign	1655	TKg
TrPzvs	Volcanic and sedimentary rocks of the Talkeetna superterrane	Triassic and Paleozoic	Appears only in cross-sections			HE002	5030	Healy	Ign	5030	TrPzvs
Kvb	Basaltic subvolcanic rocks	Late Cretaceous	Dark-gray to black, porphyritic basalt, occurring in dike swarms. Only know to intrude preCambrian and Paleozoic rocks (units PzpCp and Dmb).		K-Ar hornblende age of 79.1 Ma on basalt	HE002	2256	Healy	Ign	2256	Kvl
MDt	Totatlanika Schist	Early Mississippian to Middle Devonian	Predominantly metavolcanic and metavolcaniclastic (both felsic and mafic), and subordinate amounts of intercalated metasedimentary rocks such as black pelitic schist, and at one lacality a thin interbed of fossiliferous marble.	Crinoids, gastropods, Syringopora sp., conodont Polygnathus sp.		HE002	6510	Healy	Meta	6510	MDt

Rock unit	Unit hame	Age	Description	Fossil	Radiometric age	Source code	Class code	Quadrangle	Rock class	NSA class	Label
MDt?	Totatlanika Schist?	Early Mississippian to Middle Devonian	Predominantly metavolcanic and metavolcaniclastic (both felsic and mafic), and subordinate amounts of intercalated metasedimentary rocks such as black pelitic schist, and at one lacality a thin interbed of fossiliferous marble.			HE002	6511	Healy	Meta	6510	MDt?
Dmf	Felsic metavolcanic rocks	Late Devonian?	Massive, thick section of generally dark- to medium-gray, fine- to medium-grained schists and locally phyllites, with relict phenocrysts of quartz, orthoclase, and plagioclase.	Conodonts from interbeds of unit Dmb		HE002	7243	Healy	Meta	7240	Dyv
Dmb	Metabasalt and subordinate metasedimentary rocks	Late Devonian	600 m thick intercalated sequence of schistose and phyllitic, generally medium to dark greenish-gray, fine-grained and massive metabasalt; dark gray to black, generally fine-grained carbonaceous pelitic schist and phyllite and associated metasiltstone; aand a few thin onterbeds of black metachert, and fine- to medium-grained, dark-gray marble.	Conodonts Palmatolepis sp., Iciodus sp., Polygnathus sp.	K-Ar muscovite age of 114.6 Ma on black phyllite	HE002	7320	Healy	Meta	7320	Pzsc
Dms	Metasedimentary rocks	Late Devonian	Intercalated, generally thinly bedded, locally laminated, thick, marine sequence of dark-gray to black, carbonaceous, fine-grained, carbonaceous, fine-grained pelitic schist or phyllite; dark-gray, fine-grained, carbonaceous metasiltstone (quartzose phyllite); fine-grained, medium-gray quartzite; thin interbeds of dark-gray to black metachert; and a few interbeds of dark-gray, fine-grained fossiliferous marble.	Amphipora? sp., Disphyllum? sp., Grypophyllum? sp., Phillipsastraea? sp., Tabulophyllum? sp.		HE002	7300	Healy	Meta	7300	Pzsc
Pzk	Keevy Peak Formation	early Paleozoic	Intercalated sequence of fine- to medium-grained quartz-sericite or muscovite schist, fine-grained black quartzite, black carbonaceous pelitic schist and phyllite, stretched pebble conglomerate, greenish-gray or purple schist and slate, and a few thin marble interbeds.			HE002	5660	Healy	Meta	5660	Pzk
PzpCp	Pelitic and quartzose schist sequence [old, abandoned Birch Creek Schist]	early Paleozoic and preCambrian?	Intercalated in various proportions: medium- to fine-grained, generally medium-gray quartz-sericite and (or) muscovite pelitic schist; fine- to medium-grained, medium-gray quartzite; quartz-sericite and (or) muscovite-calcite pelitic schist; fine-grained dark-gray to black carbonaceous schist or phyllite; a few interbeds, as much as several tens of meters thick of medium-gray, fine-to medium-grained massive marble; and a few small bodies and layers of chloritc schist.			HE002	8630	Healy	Meta	9322	PzZaqs
Trcs	Calcareous sedimentary rocks	Late Triassic; middle? Norian to late Karnian	A generally thin-bedded, commonly cross-bedded, carbonaceous, dark- to medium-gray, marine, intensely deformed thick sequence of intercalated calcareous shale, argillite, sandstone, siltstone, and sandy to silty and argillaceous limestone. Sequence also contains numerous large dikes, sills as much as several tens of meters thick, and small plugs of altered diabase and gabbro. Unit locally metamorphosed (east and south). Turbidites and intercalated hemipelagic sedimentary rocks	Conondonts: Neogondolella polygnathiformis, Epigondolella primitia, also Monotis cf. M. subcircularis, Chrondites sp.		HE002	4033	Healy	Sed	4033	Trcs

Rock unit	Unit hame	Age	Description	Fossil	Radiometric age	Source code	Class code	Quadrangle	Rock class	NSA class	Label
Dy	Yanert Fork sequence	Late Devonian	Intensely deformed, thick marine sequence of dominantly metasedimentary and metavolcanic rocks. Bulk of sequence is dark-gray to black carbonaceous shale with intercalations of thin-bedded, commonly bioturbated, medium- to dark-gray, normally graded, both cross- and parallel-laminated, fine- to medium-grained lithic sandstone and siltstone (turbidites). Most regionally metamorphosed into siliceous mudstone, argillite, slate, phyllite, semischist, and impure quartzite. Also contains thin interbeds of dark- to medium-gray, locally greenish-gray, banded chert or metachert and other units, largely metavolcanic.	Radiolarians, conodont Palmatolepis sp.		HE002	7242	Healy	Meta	7242	Dy
Kva	Andesitic subvolcanic rocks	Late Cretaceous	Two large sills or dikes consisting of altered, medium-greenish-gray, porphyritic hornblende andesite.		K-Ar on hornblende of 97.3 Ma	HE002	2255	Healy	Ign	2255	Kvl
KJf	Flysch sequence	Early Cretaceous and Late Jurassic	Monotonous, intensely deformed and locally highly metamorphosed, probably several thousand of meters thick, flyschlike turbidite sequence. Consists of dark-gray to black argillite; fine- to coarse-grained, generally dark-gray polymict pebble conglomerate; subordinate black chert-pebble conglomerate; a few thin interbeds of dark-gray to black radiolarian chert and a few thin beds of dark-gray impure limestone.	Fossils sparse but age considered well controlled	K-Ar reset ages yielded Late Cretaceous and Tertiary	HE002	2850	Healy	Sed	2850	KJf
KJfk	Overthrust flyschlike rocks	Early Cretaceous -- Late Jurassic	Same as unit KJf, mapped separately for structural reasons. Monotonous, intensely deformed and locally highly metamorphosed, probably several thousand of meters thick, flyschlike turbidite sequence. Consists of dark-gray to black argillite; fine- to coarse-grained, generally dark-gray polymict pebble conglomerate; subordinate black chert-pebble conglomerate; a few thin interbeds of dark-gray to black radiolarian chert and a few thin beds of dark-gray impure limestone.	Fossils sparse but age considered well controlled	K-Ar reset ages yielded Late Cretaceous and Tertiary	HE002	2851	Healy	Sed	2851	KJfk
KJcg	Conglomerate, sandstone, siltstone, shale, and volcanic rocks	Early Cretaceous and Late Jurassic	Intercalated sequence of polymictic pebble and cobble conglomerate, sandstone, siltstone, shale, and flows and dikes of andesitic to latitic feldspar porphyry.	Buchi spp.		HE002	2821	Healy	Sed	2821	KJcg
Trvs	Metavolcanic, metavolcaniclastic, and subordinate metasedimentary rocks	Late Triassic; late Norian	Consists of intercalated sequences several hundreds of meters thick, ocurring as thrust slices. Most common rock type is dark-greenish-gray aphanitic metabasalt contiaing numerous amygdules and occurring in thick, commonly pillowed massive flows. Metavolcaniclastic rocks comprise dark-gray or dark-greenish-gray, generally fine-grained, tuffaceous metasandstones and metasiltstones. Metasedimentary rocks comprise dark-gray, locally greenish-gray slate and argillite and subordinate dark-gray finely crystalline, thinly bedded marble.	Monotis subcircularis, Heterastridium sp.		HE002	4440	Healy	Meta	4440	Trmm

Rock unit	Unit hame	Age	Description	Fossil	Radiometric age	Source code	Class code	Quadrangle	Rock class	NSA class	Label
Trcn	Chitistone and Nizina Limestones, undivided	Late Triassic; early Norian and Late Karnian	consists variably of medium- to thick-bedded, medium-gray weathering, brownish-gray lime mudstone with chert nodules and streamers, or medium- to thin-bedded, commonly thinly laminated, dark-gray to dark-brownish-gray lime mudstone, or thin- to medium-bedded, dark-gray lime mudstone and wackestone.	Halobia sp. and several conodonts		HE002	4030	Healy	Sed	4030	JTrlm
Trn	Nikolai Greenstone	Late and (or) Middle Triassic	An over 3,000-m-thick, slightly metamorphosed sequence of massive basalt flows with subordinate amounts of intercalated basaltic tuff and breccia, some bedded volcaniclastic rocks such as pebble conglomerate, sandstone, and siltstone, and possibly a few thin limestone interbeds.	Halobia superba collected from an interbed?		HE002	4420	Healy	Ign	4420	Trn
TrPam	Metasedimentary rocks sequence	Middle Triassic to Late Pennsylvanian	Lower and principal part of section (700-m-thick) consists of black argillite with laminae and thin interbeds of volcanic sandstone and lesser amounts of thin-bedded crinoidal limestone, apparently turbidite deposits forming discontinuous interbeds as much as 10-m-thick, and a few interbeds several tens of meters thick of mafic volcanic breccia. Upper part of sequence, approximately 100-m-thick consists of gray-green, red, or black thin-bedded radiolarian chert. Numerous large diabasic and gabbroic dikes and sills occur throughout the sequence. (Lower part thought to be equivalent to Slana Spur Fm of Mankomen Gp and upper part to Eagle Creek Fm, also of the Mankomen Gp.)	Crinoids, conodonts, radiolaria		HE002	5202	Healy	Meta	5202	Pe
PPav	Andesitic volcanic rocks (Correlated with Tetelna Volcanics)	Early Permian? and Pennsylvanian	Over 2,000-m-thick sequence of gray-green massive volcanic flows, breccias, and subordinate volcaniclastic rocks, all largely andesitic in composition.			HE002	6120	Healy	Ign	6120	Pat
Kgr	Granitic rocks	Late and Early Cretaceous	Most commonly tonalite but granodiorite, quartz diorite, diorite, and quartz monzodiorite.		K-Ar age range from 105 to 49 Ma, most 50 to 70 Ma thought to be reset. For NSAclass coding, ages less than 85 Ma = 2460, ages 85-110 Ma = 2470, all others = 2410	HE002	2410	Healy	Ign	2460	Kg
KJum	Ultramafic rocks	Early Cretaceous or Jurassic	Dark greenish- or brownish-gray, coarse- to medium-grained, plagioclase-bearing ultramafic that occurs in a small, sill-like intrusive			HE002	2945	Healy	Ign	2945	Jum
Kgrt	Tourmaline-bearing granite	Late or Early Cretaceous	Medium- to fine-grained, tourmaline bearing granite with a granitic to seriate texture.			HE002	2411	Healy	Ign	2411	Kgt
Jgb	Alkalic gabbro	Late Jurassic	Extremely heterogeneous series of alkali gabbros, ranging from mafic theralites through essexites and monzogabbros into monzodiorites and monzonites.		K-Ar age on biotite and hornblende 132 and 146 Ma	HE002	3390	Healy	Ign	3390	Jmu
Dmg	Metagabbro	Late Devonian?	Dark greenish-gray, fine- to medium-grined, well-foliated gabbro.			HE002	7330	Healy	Meta	7330	Dmg

Rock unit	Unit hame	Age	Description	Fossil	Radiometric age	Source code	Class code	Quadrangle	Rock class	NSA class	Label
KJa	Argillite, chert, sandstone, and limestone	Early Cretaceous and Late Jurassic	Dark-gray argillite, dark-gray to greenish-gray bedded chert, thick-bedded gray sandstone, thin-bedded gray sandstone, and rare thin beds of shelly limestone.	Radiolarians, Inoceramus sp., Buchia sublaevis		HE002	2820	Healy	Sed	2820	KJfn
JTrrs	Red and brown sedimentary rocks and basalt	Early Jurassic and Late Triassic	Maximum thickness of more than 2,000m. Basal part consists of a red-bed sequence of sandstone, siltstone, argillite, and conglomerate, with a few thin interbeds of brown fossiliferous sandstone, pink to light-gray dense limestone, and intercalated basalt flows. This sequence grades upward into brownish-gray siltstone with yellowish-brown limy concretions.			HE002	3830	Healy	Sed	3830	JTrsu
Trlb	Limestome and basalt sequence	Late Triassic; Norian?	Interlayed sequence, at least several hundreds of meters thick, of limestone, partly recrystallized to marble, and flows of altered amygdaloidal basalt.	Spondylospira(?) sp.		HE002	4021	Healy	Sed	4021	Trlb
Trr	Red beds	Late Triassic	About 500 m of red sanstone, siltstone, argillite, and conglomerate, similar to red beds of unit JTrrs			HE002	4060	Healy	Sed	4060	Trr
TrDv	Volcanogenic and sedimentary rocks	Early Triassic to Late Devonian	Heterogeneous intercalated sequence over 500m thick, of greenish-gray to black tuffaceous chert, volcanic conglomerate, lesser amounts of maroon volcanic mudstone, breccia composed largely of basaltic detritus, laminated flyschlike graywacke and shale, large lenses of light-gray, thick-bedded limestone, and poorly exposed thin beds of ammonite-bearing limestone.	Ammonites, conodonts, brachiopods		HE002	5110	Healy	Meta	5110	TrDv
Dsb	Serpentinite, basalt, chert, and gabbro	Late Devonian	Tectonically intermixed assemblage a few hundreds of meters thick largely of sheared serpentinite. Remaining component rocks occur in varying proportion is in lenticular and podiform tectonic blocks as much as several hundred meters in extent.	Radiolarians		HE002	7325	Healy	Meta	7325	Dmgs
KJfl	Flysch sequence	earliest Late Cretaceous (Cenomanian) to Late Jurassic	Lithologically identical to rocks of unit KJf: Monotonous, intensely deformed and locally highly metamorphosed, probably several thousand of meters thick, flyschlike turbidite sequence. Consists of dark-gray to black argillite; fine- to coarse-grained, generally dark-gray polymict pebble conglomerate; subordinate black chert-pebble conglomerate; a few thin interbeds of dark-gray to black radiolarian chert and a few thin beds of dark-gray impure limestone.	Only mapped flysch unit to have fossils as young as earliest Late Cretaceous (Cenomanian).		HE002	2852	Healy	Sed	2852	KJfk

Rock unit	Unit hame	Age	Description	Fossil	Radiometric age	Source code	Class code	Quadrangle	Rock class	NSA class	Label
JTrta	Crystal tuff, argillite, chert, graywacke, and limestone	Late Jurassic to Late Triassic?	Four-fifths of the sequence is composed of massive cliff-forming crystal tuff, while remaining rocks form a narrow belt along western margin of unit. Contact between two parts of sequence may be tectonic. Crystal tuff is light- to dark-gray, locally having a greenish tint, and weathers to various shades of brown. Tuff composed of abundant small feldspar crystals (albite?) in a very fine-grained matrix of devitrified volcanic glass. Argillite and chert are dark-gray to black; the graywacke is medium- to dark-gray, very fine- to medium-grained, locally having graded bedding. Limestone is medium-gray, generally phosphatic, in part sandy, and locally associated with limy siltstone and conglomerate. Some cherty beds yielded radiolarians	Radiolarians (of Callovian to early Tithonian age [Late Jurassic]), Artoasteroceras jeleskyi, Paltechioceras (Orthechioceras?) sp., Weyla sp. indicating a late Sinemurian (Early Jurassic) age		HE002	3850	Healy	Ign	3850	JTrct
Trcg	Conglomerate and volcanic sandstone	Late Triassic; late Norian	Lower part (40-50 m) of three unit division consists of cobble to boulder conglomerate composed of green volcanic rocks and red radiolarian chert clasts. Middle part, 40 to 50 m thick, composes of finer grained volcanogenic (andesitic?) conglomerate containing locally abundant fossils. Upper part of sequence consists of about 50 m of massive volcanic sandstone.	Permian radiolaria in lower part in clasts; Heterastridium sp. (Late Triassic, late Norian) in middle		HE002	4050	Healy	Sed	4050	Trcg
DOs	Sedimentary sequence	Middle Devonian to Ordovician	Medium- to dark-gray, thinly graded bedded to laminated, medium- to fine-grained sandstone; dark-gray to black argillite; intercalated layers, a few tens of meters thick, of dark-gray, generally thinly bedded, locally thick-bedded limestone and dark-gray argillite; and near the top of the section, an approximately 200-m-thick interbed of medium- to light-gray, massive, finely to medium-crystalline, partly dolomitic limestone (mapped separtely as unit 'ls').	Gastropods. Middle Devonian fossils reported from massive limestone (ls).		HE002	6970	Healy	Sed	5370	JCmd
ls (DOs)	Limestone (Sedimentary sequence)	Middle Devonian (to Ordovician)	Approximately 200-m-thick interbed of medium- to light-gray, massive, finely to medium-crystalline, partly dolomitic limestone (mapped separtely as unit 'ls'). Part of unit DOs.	Middle Devonian fossils reported from massive limestone (ls).		HE002	6971	Healy	Sed	6931	DSml
Trbd	Basalt, diabase, and subordinate sedimentary rocks	Late Triassic; Karnian and Norian	Submarine sequence of several hundred, perhaps several thousand meters thick of basalt flows, mostly pillowed, with associated sills and dikes of diabase and gabbro. Subordinate interbedded sedimentary rocks are dark-gray to dark-grayish-green, fine-grained sandstone, siltstone, and argillite, some containing abundant angular tuffaceous material.	haboloid bivalve, radiolaria		HE002	4423	Healy	Ign	4420	Trn
TrPas	Flyschlike sedimentary rocks	Late Triassic to Pennsylvanian	Intensely folded marine sequence of at least several hundred meters of dark-gray to black, massive to thin-bedded, flyschlike rocks: conglomerate, sandstone, siltstone, argillite, a few thin interbeds of impure limestone and near top of section, thin interbeds of chert intercalated with argillite.	Abundant trace fossils and displaced bryozoans, echinoderm fragments, rare brachiopods, corals, crinoids, condonts		HE002	5040	Healy	Sed	5040	TrPas

Rock unit	Unit hame	Age	Description	Fossil	Radiometric age	Source code	Class code	Quadrangle	Rock class	NSA class	Label
Kms	Melange south of McKinley fault	Late and (or) Early Cretaceous	Fault-bounded tectonic and probably sedimentary melange of Paleozoic and upper Mesozoic rocks Three distinct suites: 1) Medium- to thin-bedded, greenish-gray to tan-colored, locally black, cherty tuff, chert, argillite, and fine-grained volcanic sandstone; 2) Dark-gray to black, flyschlike rocks of argillite, slate, shale, fine- to medium-grained graywacke, subordinate bedded chert, and both chert-pebble and polymictic conglomerate (Lithologically idnetical to units KJf, KJfl, and KJfk); 3) Lenses and elongate blocks of medium-gray, generally medium-bedded and rarely massive, fine- to medium-grained fossiliferous limestone (mapped separately as unit 'msl')	Radiolaria, conodonts in cherty tuffs (Late? Devonian to Missisppian). Megafossils and conodonts from limestone (Silurian to Middle Devonian)		HE002	2192	Healy	Melange	2192	Kmar
Kmn	Melange north of McKinley fault	Late and (or) Early Cretaceous	Fault-bounded tectonic and probably sedimentary melange of Paleozoic and upper Mesozoic rocks Four disparate, intricately intermixed and pervasively sheared rock suites: 1) Blocks of medium-gray, medium-grained limestone of Silurian(?) to Devonian age (mapped as unit 'mnl'); 2) Blocks of medium-gray, medium-grained massive limestone of Late Triassic age (mapped as unit 'mnl'); 3) Dark-gray to black, flyschlike rocks of argillite, slate, shale, fine- to medium-grained graywacke, subordinate bedded chert, and both chert-pebble and polymictic conglomerate (Lithologically idnetical to units KJf, KJfl, and KJfk); 4) A poorly exposed small sliver of serpentinized ultramafic rocks, altered basalt, green and maroon tuff, and recrystallized chert, all of unknown age (mapped as unit 'mno').	Radiolaria, Buchia sp. (also see mnl)		HE002	2195	Healy	Melange	2195	Kmar
msl (Kms)	Limestone of Melange south of McKinley fault	Late and (or) Early Cretaceous	Lenses and elongate blocks of medium-gray, generally medium-bedded and rarely massive, fine- to medium-grained fossiliferous limestone mapped separately as unit 'msl' but is unit 3 of unit KMs, which is a fault-bounded tectonic and probably sedimentary melange of Paleozoic and upper Mesozoic rocks.	Labechia sp., Favosites sp., Dendrostella? sp., massive stromataporoid, and conodonts (Silurian to Middle Devonian)		HE002	2193	Healy	Melange	2193	TrSl
mnl (Kmn)	Limestone of Melange north of McKinley fault	Late and (or) Early Cretaceous	Parts 1 and 2 of unit Kmn, a fault-bounded tectonic and probably sedimentary melange of Paleozoic and upper Mesozoic rocks. Parts are: 1) Blocks of medium-gray, medium-grained limestone of Silurian(?) to Devonian age; and 2) Blocks of medium-gray, medium-grained massive limestone of Late Triassic age.	Conodonts, Sagenites?, Tryplasma sp., Lyrielasma? sp., Zelophyllum? sp.,Clavidictyon sp., Ampipora sp., Megalodus sp., Mysidia sp., Belemnite sp. interdeterminate, Cladopora sp., Coenites? sp., coral, molluscs, brachiopods, conodonts, crinoid fragments		HE002	2196	Healy	Melange	2196	TrSl

Rock unit	Unit hame	Age	Description	Fossil	Radiometric age	Source code	Class code	Quadrangle	Rock class	NSA class	Label
mno (Kmn)	Melange north of McKinley fault	Late and (or) Early Cretaceous	Part 4 of unit Kmn, a fault-bounded tectonic and probably sedimentary melange of Paleozoic and upper Mesozoic rocks Consists of a poorly exposed small sliver of serpentinized ultramafic rocks, altered basalt, green and maroon tuff, and recrystallized chert, all of unknown age.			HE002	2197	Healy	Melange	2197	mlu
Ql	Young and old landslide deposits	Quaternary	Chiefly debris avalanches and large block glides in areas of steep slopes			TL002	100	Talkeetna	Unconsol	100	Qs
Qau	Alluvium, undivided	Quaternary	Chiefly boulders, gravel, and sand with local areas of silt and clay. Alluvium on active flood plains, older alluvium on terraces of major streams, alluvial fans, outwash, swamp, marsh, and bog deposits, and alluvial deposits on broad pediment surfaces.			TL002	101	Talkeetna	Unconsol	100	Qs
Qr	Active and recently active rock glaciers	Quaternary	Chiefly rubble and diamicton			TL002	110	Talkeetna	Unconsol	100	Qs
Qa	Glacial deposits -- Alaskan glaciation	Quaternary	Chiefly rubble and diamicton. Includes end and lateral moraines.			TL002	111	Talkeetna	Unconsol	100	Qs
Qn	Glacial deposits -- Naptowne glaciation	Quaternary	End, lateral, and ground moraine, postglacial alluvial, pond, and swamp deposits, fluvial glacial deposits of all stages of Naptowne glaciation and glaciolacustrine deposits formed during Knik and Naptowne glaciations			TL002	120	Talkeetna	Unconsol	100	Qs
Qk	Glacial deposits -- Knik glaciation	Quaternary	Well-developed end and lateral moraine, shown only northwest part of quadrangle.			TL002	121	Talkeetna	Unconsol	100	Qs
Qe	Glacial deposits -- Eklutna glaciation	Quaternary	South of the Alaska Range, lateral and ground moraine have subdued geomorphic expression and include alluvial, swamp, marsh, and bog deposits. North of the Alaska Range, end and lateral moraines are relatively fresh.			TL002	130	Talkeetna	Unconsol	100	Qs
Qpe	Glacial deposits -- pre-Eklutna age glaciations	Quaternary	Subdued lateral(?) and ground moraines on north side of Alaska Range, although glacial erratics and well-modified drift on top Yenlo Hills are probably also deposits of this glaciations.			TL002	131	Talkeetna	Unconsol	100	Qs
Tc	Coal-bearing rocks	Possible Oligocene and Miocene	About 30 m of subituminous coal, with individual beds up to 9 m thick. Coal-bearing rocks contain interbeds ferruginous siltstone and silty shale.			TL002	200	Talkeetna	Sed	640	Tcb
Ts	Continental sedimentary rocks	Tertiary, Paleocene	Chiefly medium- to dark-gray phyllitic shale, shale, sandstone, grit, and conglomerate with minor carbonaceous shale and tuffaceous sandstone.	Metasequoia		TL002	201	Talkeetna	Sed	1920	Kcs
KJb	Pillow basalt	Early Cretaceous and Jurassic(?)	Dark-greenish-gray elongate bodies of massive-weathering, resistant pillow basalt. The unit includes interbeds and lenses of mudstone, shale, and siltstone. The basalt locally includes gabbro which may represent its feeder source.			TL002	300	Talkeetna	Ign	2890	JTrtv

Rock unit	Unit hame	Age	Description	Fossil	Radiometric age	Source code	Class code	Quadrangle	Rock class	NSA class	Label
KJs	Undivided marine sedimentary rocks	Early Cretaceous and Jurassic(?)	Moderate- to deep-water, intertonguing marine sedimentary rocks consisting chiefly of gray to black phyllite, argillite, graywacke, and siltstone which are in part turbidite deposits; lesser amounts of gray, green, and red chert, conglomerate, grit, and thin beds of limy mudstone and impure limestone. Conglomerate contains clasts of medium- to dark-gray chert, phyllite, and sandstone in a fine-grained sheared graywacke matrix. North of Denali Fault	belemnites, Buchia, and occasional Inoceramus of Valanginian to Barremian age)		TL002	302	Talkeetna	Sed	2852	KJfn
Pzsl	Shale and limestone	Early Paleozoic?	Marine sedimentary rocks that typically form a thin- to medium-interbedded sequence of black, sooty, carbonaceous, and calcareous shale, dark-gray calcareous siltstone, medium- to dark-gray limestone, and minor gray quartzite. Shale locally amounts to as much as 70 percent of unit, is generally calcareous and contains thin laminae of dark-gray siltstone.			TL002	400	Talkeetna	Sed	4033	Trcs
Pzsv	Quartzite, semischist, and metavolcanic rocks	early Paleozoic? or possibly late preCambrian	Tan to light-greenish-gray, low-grade (greenschist facies), regionally metamorposed quartzite, quartz semischist, quartz grit, metavolcanic rocks, and minor conglomerate, limestone, phyllite, and quartz-muscovite schist. Isoclinally folded.			TL002	401	Talkeetna	Meta	9322	PzZaqs
Tmt	Tonzona pluton	Early Tertiary	Small composite biotite-muscovite granite pluton			TL002	210	Talkeetna	Ign	1320	Tpgr
TKi	Undivided intrusive rocks -- dikes	Early Tertiary or Late Cretaceous	Intermediate altered porphyry dikes -- most not shown on map as too small			TL002	211	Talkeetna	Ign	1601	TKd
MzPzg	Gabbro and quartz diorite	Mesozoic and (or) Paleozoic	Dark-green, rust-weathering coarse-grained altered gabbro and minor quartz diorite.			TL002	600	Talkeetna	Ign	5180	MzPzi
MzPzu	Serpentinite	Mesozoic and (or) Paleozoic	Orange- to light-brown-weathering, light- to dark-green, fault-bounded body of serpentinite and minor talc schist.			TL002	601	Talkeetna	Meta	5290	MzZum
Tk	Kenai Group, undivided	Pliocene and Miocene	Fluvial sedimentary rocks correlative with estuarine and nonmarine clastic sedimentary Tertiary formations assigned to the Kenai Group.			TL002	220	Talkeetna	Sed	560	Tk
Tps	Sterling(?) Formation	Pliocene	Orange, light-tan, or light-gray, massive-bedded conglomerate, distinguished from conglomerate in the Tyonek Fm by color, relative coarseness, and clast lithology. As much as 770 m thick.			TL002	221	Talkeetna	Sed	540	Tsf
Tts	Tyonek(?) Formation -- Sandstone member	Miocene	Approximately 80 percent sandstone, 20 percent siltstone and claystone, and less than 1 percent conglomerate, coal, and volcanic ash. Occurs in repetitive cycles 7- to 23-m-thick.			TL002	230	Talkeetna	Sed	600	Tty
Ttc	Tyonek(?) Formation -- Conglomerate member	Miocene	At least 40 percent conglomerate, 20 percent sandstone, and less than 40 percent siltstone, claystone, and coal. Conglomerate is light-brown, light-gray, or bluish-gray and poorly indurated. Sandstone is coarse, poorly sorted and pebbly, and very poorly indurated.			TL002	231	Talkeetna	Sed	600	Tty

Rock unit	Unit hame	Age	Description	Fossil	Radiometric age	Source code	Class code	Quadrangle	Rock class	NSA class	Label
Tvs	Undivided volcanic and sedimentary rocks	Tertiary	Interbedded tuff, mafic volcanic flows, sandstone, shale, and minor calcareous mudstone. Volcanic rocks are chiefly medium- to coarse-grained greenish-gray crystal lithic lapilli tuff and volcanic rubble flows in units as much as 150 m thick.			TL002	240	Talkeetna	Ign	1000	Tvu
KJs	Undivided marine sedimentary rocks	Cretaceous and Early Jurassic	Medium- to dark-gray, generally isoclinally folded, thick sequence of lithic graywacke, phyllite, and shale with local lenses of quartz-chert conglomerate. Minor fossiliferous limestone, radiolarian chert, and red ferruginous sandstone and siltstone. [Description suggests could include rocks of the Talkeetna Formation, Matanuska Formation, and Nelchina Ls. or Herendeen Fm., along with other units.] South of Denali Fault.	Inoceramus, ammonites, brachiopods, and pelecypods		TL002	301	Talkeetna	Sed	2850	KJf
Pzbs	Pillow basalt	middle or late Paleozoic	Chiefly dark-greenish-gray massive pillow basalt and petrographically similar coarse-grained pyroxene gabbro and basaltic dikes and sills. as mapped, includes varying amounts of interstratified agglomerate, flow breccia, aquagene tuff, and thick, chaotic sequences of eugeosynclinal sedimentary rocks.			TL002	410	Talkeetna	Ign	5450	JTrtv
Pzv	Volcanic and sedimentary rocks	middle or late Paleozoic	Dark-greenish-gray massive-weathering mafic volcanic rocks that include pillow basalt, breccia, agglomerate, tuff, and massive basalt flows. Volcanic rocks commonly contain interbeds of black phyllite, chert-pebble conglomerate, light-green tuff, and graywacke.			TL002	411	Talkeetna	Ign	5410	Pzvs
Pad	Conglomerate of Mount Dall	Middle Pennsylvanian	Dark-brown to yellowish-brown-weathering sequence of conglomerate, sandstone, siltstone, and shale mainly of continental origin that forms a broad, open, east-plunging syncline. Unit is chiefly massive lenticular beds of conglomerate and sandstone with numerous cut and fill channels.	Limestone clasts in conglomerate contain Middle Devonian(?) fossils. Shale and sandstone beds locally contain abundant plant fossils of Middle Pennsylvanian age.		TL002	420	Talkeetna	Sed	6010	PDsc
Pzus	Undivided sedimentary rocks	Mississippian, Pennsylvanian, and (or) Devonian	A depositionally and structurally complex terrane of chiefly marine flysoid sedimentary rocks which include: 1) trench assemblages characterized by terriginous turbidites, cherty pelagites, and basaltic pillow lavas; 2) slope and shelf assemblages that include chert, shale, reefoid limestone, and, locally, terrestrial conglomerate and redbeds, and 3) a thick locally terrestrial conglomerate and sandstone assemblage.	Fossils of varying late Paleozoic ages		TL002	421	Talkeetna	Sed	5370	JCmd
Dl	Limestone	Middle and Late Devonian	Thin-bedded gray micrites grading upward into fossiliferous, massive to reefoid, biostromal beds of colonial rugose corals and massive stromatoporoids.	Conodonts of Late Devonian; abundant coral and shelly faunas of late Middle and early Late Devonian; locally late Early or Middle Devonian		TL002	500	Talkeetna	Sed	6615	DSmdl
Pzp	Phyllite	Paleozoic	Dark-gray phyllite, phyllitic shale, and argillaceous siltstone.			TL002	430	Talkeetna	Meta	5370	JCmd

Rock unit	Unit hame	Age	Description	Fossil	Radiometric age	Source code	Class code	Quadrangle	Rock class	NSA class	Label
Sl	Limestone	Silurian	Light-gray to light-brown massive-weathering marbleized limestone and local areas of thin-bedded to laminated limestone.	Graptolites, dasycladacean algae, corals		TL002	700	Talkeetna	Sed	6615	DSmdl
Oc	Chert and shale	Early to Middle Ordovician	Chaotically folded allochthonous sequence of interbedded graptolitic shale and chert and minor sandstone and siltstone.	Graptolites		TL002	800	Talkeetna	Sed	7580	SCpl
Pzd	Sedimentary rocks of Dillinger River (limey)	Paleozoic	Thick sequence of sedimentary rocks consisting of an undetermined thickness of interbedded lime mudstone and shale, more than 900 m of apparently unfossiliferous deep-water, well-bedded lime mudstone (micrites), and at least 900 m of interbeeded sandstone, shale, and limestone.	Cardiolacea of late Wenlockian (Silurian) age, conodonts of Silurian age.		TL002	431	Talkeetna	Sed	5310	DCd
Tf	Foraker pluton	Eocene	Medium-grained, equigranular biotite and hornblende granodiorite.		K-Ar? of 38 MA	TL002	241	Talkeetna	Ign	1292	Toem
Tm	McKinley Sequence -- McKinley pluton	Early Tertiary	Medium- to coarse-grained, hypidiomorphic-granular biotite granite.			TL002	250	Talkeetna	Ign	1320	Tpgr
Tmc	McKinley Sequence -- Cathedral pluton	Early Tertiary	Medium- to coarse-grained, hypidiomorphic-granular biotite and biotite-muscovite granite and minor phases of biotite-hornblende granodiorite.			TL002	251	Talkeetna	Ign	1320	Tpgr
Tmk	McKinley Sequence -- Kahiltna pluton	Early Tertiary	Two bodies, southwest is fine- to coarse-grained, hypidiomorphic-granular biotite and biotite-muscovite granite and granodiorite. Northeast body is medium- to coarse-grained, hypidiomorphic-granular biotite-muscovite granite.			TL002	260	Talkeetna	Ign	1320	Tpgr
Tmr	McKinley Sequence -- Ruth pluton	Early Tertiary	Three bodies, Chulitna body is medium- to coarse-grained, weakly foliated, hypidiomorphic-granular biotite granite. South body is coarse-grained, hypidiomorphic-granular biotite granite and granodiorite. North body is medium- to coarse-grained, hypidiomorphic-granular biotite and biotite-muscovite granite.			TL002	261	Talkeetna	Ign	1320	Tpgr
Te	Granodiorite of Mount Estelle	Early Tertiary	Medium-grained, hypidiomorphic-granular biotite-hornblende granodiorite. Tourmaline is a characteristic accessory mineral.		K-Ar ages on hornblende of 65 and 66 Ma	TL002	270	Talkeetna	Ign	1350	Thgd
Tcp	Composite plutons	Early Tertiary	Average composition is quartz monzonite but ranges from peridotite to granite.		K-Ar ages range from 64.6 and 67.4 Ma	TL002	271	Talkeetna	Ign	1320	Tpgr
TKi	Unidivided intrusive rocks	Late Cretaceous or Tertiary	Probably range in composition from granite to tonalite			TL002	211	Talkeetna	Ign	1650	TKi
MzPzi	Unidivided intrusive rocks	Mesozoic or Paleozoic	Dark-gray to greenish-gray dikes and sills ranging in composition from basalt to granodiorite.			TL002	610	Talkeetna	Ign	5160	MzPzi
MzPzd	Undivided dunite and serpentinite	Mesozoic or Paleozoic	Alpine-type ultramafic rocks and minor talc schist. Chromite-bearing dunite in sills.			TL002	611	Talkeetna	Ign	5190	MzZum
JTrsv	Chulitna sequence -- Sedimentary and volcanic rocks	Jurassic to late Triassic	Massive cliff-forming outcrops of argillite, radiolarian chert, siltstone, minor pillow basalt, and impure micritic limestone.			TL002	900	Talkeetna	Sed	3850	JTrct

Rock unit	Unit hame	Age	Description	Fossil	Radiometric age	Source code	Class code	Quadrangle	Rock class	NSA class	Label
JTrvs	Chulitna sequence -- Volcanic and sedimentary rocks	Early Jurassic to late Paleozoic	Distinctive light-green to maroon volcaniclastic rocks that range from tuffaceous shale to a quartz-pebble conglomerate having a tuffaceous matrix. Commonly contain interbeds of massive micritic and bioclastic limestone, minor chert, argillite, rust-weathering siltstone and sandstone, and basaltic tuff.	Thecosmilia, Heterastridium, and Septocardia(?) of Late Triassic (Norian) age		TL002	281	Talkeetna	Ign	4235	JTrct
Trlb	Chulitna sequence -- Limestone and basalt	Early Jurassic to late Paleozoic	Limestone and basalt which grades southwestward into interbedded gray limestone, dark-green pillow basalt, massive and locally semischistose basaltic tuff, calcareous sandstone, and minor black chert and silty limestone.	Monotis subcircularis, Heterastridium, and Cassianella of Late Triassic (Norian) age		TL002	290	Talkeetna	Sed	4021	Trlb
Qa	Alluvial deposits	Holocene	Chiefly unconsolidated sand and gravel. Flood-plains, fans, and cones. Oldest deposits may be outwash.			MH002	100	Mount Hayes	Unconsol	100	Qs
Qfl	Fluviolacustrine deposits	Holocene	Chiefly consisting of sand, silt, and clay. Lake, pond, and low-gradient streem deposits.			MH002	112	Mount Hayes	Unconsol	100	Qs
Qc	Colluvial deposits	Holocene	Chiefly rubble, gravel, sand, silt, and clay. Talus and other slope debris deposits, also includes alluvium of minor streams, and locally glacial, rock glacier, and mass-wasting deposits. May include older glacial drift and locally grades into glacial deposits.			MH002	107	Mount Hayes	Unconsol	100	Qs
Qam	End and lateral moraines of Alaskan glaciation	Holocene	Chiefly rubble and diamicton			MH002	130	Mount Hayes	Unconsol	100	Qs
Qwm	End and lateral moraines of Wisconsin glaciation	Holocene and Pleistocene	Poorly sorted and unstratified till of unconsolidated sand and gravel. Chiefly rubble and diamicton, local sand and gravel.			MH002	135	Mount Hayes	Unconsol	100	Qs
Qwf	Glaciofluvial deposits of Wisconsin glaciation	Holocene and Pleistocene	Moderately well-stratified layers and lenses of well-rounded gravel with a matrix of silt and sand. Poorly to moderately well sorted with lenses of well-sorted sand locally.			MH002	140	Mount Hayes	Unconsol	100	Qs
Qog	Drift of older glaciations	Pleistocene	Glacial deposits of subdued geomorphic expression, probably of early Wisconsin or Illinoian age occurring beyond limit of Wisconsin moraines. At higher elevations, chiefly unconsolidated diamicton and boulder deposits. At lower elevations, consist chiefly of unconsolidated glaciofluvial deposits of moderately well stratified and sorted gravel and sand.			MH002	190	Mount Hayes	Unconsol	100	Qs
Tn	Nenana Gravel	Pliocene	Consists chiefly of poorly cemented conglomerate but includes some sandstone and siltstone. Clast composition in the MH D-6 quadrangle is (in decreasing order of abundance) schist, quartzite, granitic rocks, gabbro, and metagabbro. Top of unit is eroded. Unconformably overlies MH units grgm and jcs and locally unit Ts. Overlies unit Tsju. Uncomformably overlain by Pleistocene glacial deposits.			MH002	570	Mount Hayes	Sed	570	Tn

Rock unit	Unit hame	Age	Description	Fossil	Radiometric age	Source code	Class code	Quadrangle	Rock class	NSA class	Label
Ts	Sandstone	Pliocene, Miocene, and Oligocene	Chiefly brown sandstone and graywacke but includes some interbedded conglomerate and dark argillite. Generally fault bounded. Sandstone is fine- to medium-grained, poorly sorted, and contains angular grains. Composition varies from quartz grains in a clay-rich matrix to quartz, plagioclase, K-feldspar, pyroxene, hornblnde, and biotite in a clay-rich matrix. Conglomerate clasts chiefly granitic rocks and schist.	Plants of Oligocene, Miocene, and Pliocene age		MH002	500	Mount Hayes	Sed	500	Tsu
Tsj	Sedimentary rocks of Jarvis Creek coal field -- undivided	Early Tertiary	Chiefly sandstone, mudstone, conglomerate, and coal. (Unit of Wahraftig and Hickcox, 1955.)	Teriary plant fossils		MH002	910	Mount Hayes	Sed	910	Tjc
Tsju	Sedimentary rocks of Jarvis Creek coal field -- Upper member	Early Tertiary	Chiefly dark-gray mudstone and sandstone containing scattered coal beds. Maximum estimated thickness is 300 m.	Teriary plant fossils		MH002	911	Mount Hayes	Sed	910	Tjc
Tsjm	Sedimentary rocks of Jarvis Creek coal field -- Middle member	Early Tertiary	Chiefly buff arkosic sandstone containing claystone and scattered coal beds and a prominent coal and shale zone at base. Maximum estimated thickness is 300 m.	Teriary plant fossils		MH002	912	Mount Hayes	Sed	910	Tjc
Tsjl	Sedimentary rocks of Jarvis Creek coal field -- Lower member	Early Tertiary	Chiefly angular quartz sandstone and conglomerate; some claystone and coal. Maximum estimated thickness is 150 m.	Teriary plant fossils		MH002	913	Mount Hayes	Sed	910	Tjc
la	Lamprophyre, alkali gabbro, and alkalic diorite	Early Tertiary and Late Cretaceous	Undifferentiated dikes, sills, and small plutons. Predominantly fine- to medium-grained, panidiomorphic granular to porphyritic texture.		Two clusters of K-Ar ages in the east-central part of quad. 62.9 to 69.2 Ma in the Robertson River area and 69.3 to 107.6 Ma in the Tok River area	MH002	1690	Mount Hayes	Ign	1690	TKl
md	Monzonite and diorite	Early Tertiary and Late Cretaceous	Monzonite and diorite, includes lesser quartz monzonite and quartz diorite. Undifferentiated dikes, sills, and small plutons. Fine- to medium-grained, hypautomorphic granular and locally porphyritic			MH002	1661	Mount Hayes	Ign	1660	TKm
grn1	Granitic unit 1	Early Tertiary and (or) Late Cretaceous	Granite dikes, stocks, and small plutons. Locally schistose. Fine- to coarse-grained, hypautomorphic granular and locally porphyritc.			MH002	1655	Mount Hayes	Ign	1655	TKg
grn2	Granitic unit 2	Early Tertiary and (or) Late Cretaceous	Granodiorite dikes, stocks, and small plutons. Locally schistose. Fine- to coarse-grained, hypautomorphic granular and locally porphyritc.			MH002	1660	Mount Hayes	Ign	1660	TKm
grn3	Granitic unit 3	Early Tertiary and (or) Late Cretaceous	Quartz diorite and diorite dikes, stocks, and small plutons. Locally schistose. Fine- to coarse-grained, hypautomorphic granular and locally porphyritc.			MH002	1665	Mount Hayes	Ign	1665	TKqd
grgr	Granite of Gerstle River	Early Tertiary	Chiefly biotite granite, include minor quartz diorite. Fine- to medium-grained, hypautomorphic granular and locally porphyritc.		K-Ar ages of 53.4 and 54.3 Ma	MH002	1332	Mount Hayes	Ign	1320	Tpgr
grbc	Granite of Buchanan Creek	Early Tertiary or Late Cretaceous	Chiefly biotite-hornblende granite, with lesser granodiorite and quartz diorite. Fine- to medium-grained, hypautomorphic granular and locally porphyritc.			MH002	1656	Mount Hayes	Ign	1655	TKg
grmh	Granite of Mount Hayes	Early Tertiary or Late Cretaceous	Chiefly biotite granite, with fine- to medium-grained, hypautomorphic granular texture.			MH002	1657	Mount Hayes	Ign	1655	TKg

Rock unit	Unit hame	Age	Description	Fossil	Radiometric age	Source code	Class code	Quadrangle	Rock class	NSA class	Label
grmr	Granodiorite of Molybdenum Ridge	Late Cretaceous	Chiefly biotite-hornblende granodiorite, with lesser granite and quartz diorite. Medium-grained, hypautomorphic granular texture, locally porphyritic.		K-Ar biotite and hornblende dates and U-Pb zircon ages ranging from 84 to 93 Ma	MH002	2480	Mount Hayes	Ign	2480	Kg
grgm	Granite of Granite Mountain	Late Cretaceous	Chiefly biotite-hornblende granite, includes minor quartz diorite. Fine- to medium-grained, hypautomorphic granular texture.		U-Pb zircon age of 90 Ma	MH002	2461	Mount Hayes	Ign	2475	Kg
grma	Granite of Macomb Plateau	Late Cretaceous	Chiefly hornblende granite, biotite granite, hornblende-biotite granite, hornblende granodiorite, and minor quartz diorite. Very fine- to medium-grained, hypautomorphic granular texture, locally porphyritic.		Pb-alpha ages of 90 and 110 Ma (Highly suspect)	MH002	2462	Mount Hayes	Ign	2475	Kg
grrc	Granite of Rumble Creek	Late Cretaceous	Chiefly biotite-hornblende granite and granodiorite. Fine- to medium-grained, hypautomorphic granular texture, locally porphyritic.		K-AR hornblende age of 89 Ma	MH002	2463	Mount Hayes	Ign	2475	Kg
mgb	Gabbro, diorite, metagabbro, metadiorite, metadiabase, and amphibolite	Cretaceous	Chiefly hornblende metagabbro, metadiabase, and minor amphibolite. Undifferentiated dikes, sills, and small plutons. Metagabbro and metadiabase generally fine- to medium-grained with hypautomorphic granular to diabasic texture, locally porphyritic. Amphibolite is fine- to medium-grained with granoblastic to porphyroblastic texture, containing hornblende porphyroblasts up to 2 mm in size. Correlative with unit gbm.			MH002	2670	Mount Hayes	Meta	2670	Kmum
gbm	Gabbro of Mount Moffit	Cretaceous?	Gabbro of fine- to medium-grained with hypautomorphic granular to diabasic texture. Correlative with unit mgb.			MH002	2440	Mount Hayes	Ign	2440	Kmum
lga	Augen gneiss and schist	Mississippian (intrusion age)	Chiefly medium-grained, mylonitic gneiss. Intensely deformed, exhibiting a strong schistosity showing gentle north or south dips. Contains diagnostic amphibolite facies minerals and shows retrogression to greenschist facies.		Intrusion from U-Pb zircon age of 333 to 345 Ma from Big Delta quadrangle to north and metamorphism from Rb-Sr ages on multiple phases of 110 Ma	MH002	6520	Mount Hayes	Meta	6521	MDyao
lgr	Medium-grained gneissose granitic rocks	Devonian (intrusion age)	Chiefly metagranite but includes some metamorphosed quartz diorite and meta granodiorite. Relict hypautomorphic granular texture. Intensely deformed, exhibiting a strong schistosity. Contains diagnostic amphibolite facies minerals and locally shows retrogression to greenschist facies.		Intrusion from U-Pb zircon age of 360 Ma and metamorphism from Rb-Sr isochron at 110 Ma	MH002	7252	Mount Hayes	Meta	7250	MDyao
lgs	Pelitic schist and quartzite	Devonian and older	Chiefly fine- to medium-grained, poly-deformed, mylonitic pelitic schist and minor quartzite and calc-schist. Unit intensely deformed, exhibiting a strong schistosity that dips gently north or south. Metamorphised to middle to upper amphibolite facies and locally retrograded to lower greenschist facies.		U-Pb zircon age from qtz-bio-feld schist in Big Delta quadrangle to north was 365 Ma.	MH002	7403	Mount Hayes	Meta	8630	PzZysa

Rock unit	Unit hame	Age	Description	Fossil	Radiometric age	Source code	Class code	Quadrangle	Rock class	NSA class	Label
mg	Medium-grained granitic gneiss	Devonian (intrusion age)	Chiefly fine- to medium-grained mylonitic gneiss derived from granite, granodiorite, and quartz diorite. Includes minor augen gneiss. Texture varies from protomylonitic to mylonitic schist. Intensely deformed exhibiting strong schistosity. Schistosity and parallel composition layering dip moderately southwest and strike northwest. Metamorphosed to epidote amphibolite facies, locally to amphibolite facies.		U-Pb zircon ages about 372 Ma indicate intrusion, Rb-Sr mineral isochron indicates metamorphism at 102 Ma	MH002	7250	Mount Hayes	Meta	7250	MDyao
ms	Metamorphosed pelitic, calcareous, and quartz-feldspar sedimentary rocks	Devonian or older	Chiefly fine-grained, mylonitic, metasedimentary schists. Quartz-mica schist and lesser calc-schist. Intensely deformed exhibiting strong schistosity. Schistosity and parallel composition layering dip moderately southwest and strike northwest. Metamorphosed to epidote amphibolite facies, locally to amphibolite facies.			MH002	7400	Mount Hayes	Meta	9322	PzZaqs
jcg	Fine- to medium-grained gneissose granitic rocks	Devonian (intrusion)	Chiefly schistose metagranodiorite, and augen gneiss. Intensely deformed exhibiting strong schistosity.		Intrusion age from U-Pb zircon determination of 372 Ma	MH002	7251	Mount Hayes	Meta	7250	MDyao
jcv	Fine-grained schistose metavolcanic rocks and metasedimentary rocks	Devonian (eruption)	Chiefly fine-grained, mylonitic, metavolcanic rocks interlayered with lesser metasedimentary rocks. Metavolcanic rocks consist chiefly of metamorphosed quartz keratophyre, dacite, and andesite and lesser metarhyodacite and metabasalt derived from fine-grained tuffs and flows. Metasedimentary rocks chiefly quartz-mica schist and some calc-schist, marble, skarn, and quartzite. Protoliths thought to be pelite, quartz sandstone, siltstone, marl and limestone. Metamorphism ranges from lower greenschist to lower amphibolite facies. Intensely deformed exhibiting strong schistosity which dips gently to moderately north or south.		U-Pb zircon age determinations on metavolcanic rocks yielded ages of 364, 372, and about 375 Ma	MH002	7241	Mount Hayes	Meta	7320	Pzsc
jcs	Fine-grained metasedimentary rocks	Devonian and older	Chiefly fine-grained, mylonitic, metasedimentary rocks. Rocks consist of 65 percent quartz-mica schist, 15 percent quartzite, and 5 percent each of chlorite-wihite mica schist, quartz-biotite schist, calc-schist, and marble. Metamorphism ranges from lower greenschist to lower amphibolite facies. Intensely deformed exhibiting strong schistosity which dips gently to moderately north or south.		K-Ar ages on white mica range from 106 to 118 Ma, thought to be metamorphic age rather than cooling age (?)	MH002	7401	Mount Hayes	Meta	9322	PzZaqs
hgv	Fine-grained schistose volcanic rocks and phyllite	Devonian (extrusion)	Chiefly fine-grained, metavolcanic and metasedimentary phyllonites and blastomylonites. Metavolcanic rocks chiefly metamorphosed quartz keratophyre and andesite and sparse dacite and basalt. Metasedimentary rocks chiefly quartz-mica phyllonite, quartzite, quart-calc phyllonite, and marble. Protoliths thought to be siltstone, sandstone, graywacke, marl and limestone. Unit intensely recrystallized and ductily deformed. Metamorphosed at lower to middle greenschist facies.		U-Pb zircon yield ages of 375 Ma	MH002	7240	Mount Hayes	Meta	7240	Dyv

Rock unit	Unit hame	Age	Description	Fossil	Radiometric age	Source code	Class code	Quadrangle	Rock class	NSA class	Label
hgs	Fine-grained schistose sedimentary rocks and volcanic rocks	Devonian and older	Chiefly fine-grained, pale-yellow, pale-green, and graphitic black metasedimentary phyllonite and blastomylonite with minor metavolcanic blastomylonite. Predominant lithologies are quartz-mica phyllonite, quartz-calc phyllonite, quartzite, marble, and metavolcanic blastomylonite. Protoliths thought to be siltstone, shale, marl, limestone, quartz-rich volcanic rocks, and volcanic graywacke. Intense recrystallization and ductile deformation, exhibits strong schistosity. Metamorphosed to lower to middle greenschist facies.			MH002	7402	Mount Hayes	Meta	7402	Dys
ag	Metamorphosed granitic rocks	Late to middle Cretaceous	Consists chiefly of metamorphosed stocks, dikes, and sills of diorite and minor quartz diorite, granite, granodiorite, and gabbro. Fine- to medium-grained, having relict hypautomorphic granular texture. Unit moderately deformed and exhibits moderate schistosity that dips steeply to vertically and strikes west-northwest.		U-Pb zircon age of 71 Ma. In adjacent Healy quadrangle, Ar-Ar analysis of hornblende yielded 106 Ma. K-Ar ages on biotite range from 18.2 to 27 Ma and hornblende 36.8 Ma	MH002	2600	Mount Hayes	Sed	2600	Kmi
as	Metamorphosed sedimentary rocks	Triassic to Silurian	Chiefly of fine- to medium-grained, mylonitic, calc-schist, marble, quartz-mica schist, and quartzite. Protoliths thought to be marl, limestone, pelite, and sandstone. Unit intensely ductily deformed and schistosity dips steeply to vertically and strikes west-northwest. Exhibits evidence of multiple metamorphism, earlier at upper amphibolite facies and later at middle greenschist facies	Conodont fragments of post-Ordivician age		MH002	5201	Mount Hayes	Meta	5201	Trcs
wm	Melange	Cretaceous, Devonian, and Silurian	Structural melage consisting of two assemblages: 1) Cretaceous flysch and volcanic rocks consisting mainly of argillite, and weakly metamorphosed quartz silitstone, quartz sandstone, graywacke, and conglomerate and minor andesite and acite and 2) Small to large fault bounded lenses of Silurian(?) and Devonian limestone and marl.	Cretaceous ammonite in unit 1 and Silurian(?) and Devonian mega- and micro-fossils.		MH002	2195	Mount Hayes	Melange	2195	Kmar
Tsc	Sandstone and conglomerate	Miocene to Eocene	Chiefly continental clastic deposits of light-colored, fine-grained, poorly sorted sandstone and having locally interbedded siltstone, pebbly sandstone, pebble to cobble conglomerate, and sparse thin coal layers. In vicinity of "The Hoodoos", contains very sparse rhyodactic ash layers. Conglomerate clasts predominantly andesite porphyry, fine-grained granitic rocks, schist, quartz(?), and locally abundant ultramafic rocks and coal.	Plants and pollen of late Eocene to Pliocene age	K-Ar ages of hornblende from included ash were 5.5 and 31.1 Ma	MH002	510	Mount Hayes	Sed	500	Tsu

Rock unit	Unit hame	Age	Description	Fossil	Radiometric age	Source code	Class code	Quadrangle	Rock class	NSA class	Label
Tc	Conglomerate	Eocene	Chiefly continental clastic deposits of poorly sorted, crudely bedded to massive, polymictic conglomerate and lesser sandstone. Contains clasts of rhyodacite to dacite tuff, the Nikolai Greenstone, argillite, volcanic sandstone, andesitic to dacitic rocks of the Eagle Creek and Slana Spur Formations, quartz Diorite, greenschist, gabbro and ultramafic rocks. Local thin beds of coal occur in sandstone layer.			MH002	840	Mount Hayes	Sed	500	Tsu
Tv	Volcanic rocks	Eocene	Chiefly vitric-lithic-crystal ash-flow tuff, breccia, agglomerate, flows, dikes, and sills, and minor volcanic sandstone, conglomerate, and fossiliferous limestone.	?	K-Ar whole-rock age on tuff was 49 Ma	MH002	1100	Mount Hayes	Ign	1140	Tcv
grs1	Granitic unit 1	Cretaceous and Late Jurassic	Chiefly granitic and minor monzonite and diorite dikes, stocks, and small plutons. Fine- to medium-grained, hyautomorphic granular texture. Locally metamorphosed to lower greenschist facies.			MH002	2900	Mount Hayes	Ign	2900	KJg
grs2	Granitic unit 2	Cretaceous and Late Jurassic	Chiefly hornblende-biotite granodiorite and hornblende granodiorite and minor granodiorite and granite dikes, stocks, and small plutons. Includes sparse syenodiorite and quartz diorite. Fine- to medium-grained, hyautomorphic granular texture. Locally metamorphosed to lower greenschist facies.			MH002	2905	Mount Hayes	Ign	2900	KJg
grs3	Granitic unit 3	Cretaceous and Late Jurassic	Quartz diorite and diorite dikes, stocks, and small plutons. Includes sparse syenodiorite and quartz diorite. Fine- to medium-grained, hyautomorphic granular texture. Locally metamorphosed to lower greenschist facies.			MH002	2910	Mount Hayes	Ign	2900	KJg
grsg	Granite of Susitna Glacier	Early Tertiary	Chiefly biotite-white mica granite. Fine- to medium-grained, hyautomorphic granular texture.		Three K-Ar hornblende and biotite ages of 35.5 to 36.1 Ma	MH002	1276	Mount Hayes	Ign	1290	Toegr
grcl	Granite porphyry of Caribou Lake	Early Cretaceous and (or) Late Jurassic?	Chiefly biotite granite porphyry. Fine-grained; locally medium-grained. Local hyautomorphic granular texture. Local extensive hydrothermal alteration.			MH002	2901	Mount Hayes	Ign	2900	KJg
grrm	Granodiorite of Rainbow Mountain	Early Cretaceous and (or) Mississippian	Chiefly biotite granite porphyry. Fine-grained; locally medium-grained. Local hyautomorphic granular texture. Local extensive hydrothermal alteration.		A possible Late Mississippian age from K-Ar hornblende analysis 326 Ma.	MH002	5170	Mount Hayes	Ign	5170	MzPzg
um	Ultramafic and associated rocks	Mesozoic?	Chiefly variably serpentinized pyroxenite, peridotite, dunite, schistose amphibolite, serpentinite, and hornblende-plagioclase gneiss derived from gabbro. Locally intruded by gabbro dikes, tonalite, and granite. Intensely deformed and fault-bounded.		K-Ar ages on hornblende and biotite of 123 and 126 Ma	MH002	4890	Mount Hayes	Ign	4890	Mzum
gg	Gneissose granitic rocks	Early Tertiary and Late Cretaceous	Chiefly gneissose granodiorite and quartz diorite and minor granite. Fine- to medium-grained, with relict hypautomorphic granular, seriate, and porphyritic textures. Locally grades to migmatite. Unit metamorphosed at middle to upper amphibolite facies.		U-Pb zircon and sphene and K-Ar mica and hornblende ages range between 29.2 to 70 Ma.	MH002	1720	Mount Hayes	Meta	1720	TKgg

Rock unit	Unit hame	Age	Description	Fossil	Radiometric age	Source code	Class code	Quadrangle	Rock class	NSA class	Label
sa	Schist and amphibolite	Late Cretaceous or older	Chiefly garnet-biotite-plgioclase schist and hornblende amphibolite. Relatively older, more mafic, and more highly metamorphosed variation of gneissose granitic rocks (unit gg) which locally intrude this unit. Intensely regionally metamorphosed and penetratively deformed gabbro, quartz gabbro, diorite, and quartz diorite. Includes local pelitic schist and pelitic gneiss. Fine- to medium-grained.			MH002	5205	Mount Hayes	Meta	5205	Mzsa
mig	Migmatite	Cretaceous?	Transitional rock unit between mimatitic schist (unit mgsh) and gneissos granitic rocks (unit gg). Grades from gneissose granitic rocks, containing fragments of nearly completely assimilated schist and amphibolite, to highly contorted schist and amphibolite with diffuse veins of granodiorite to diorite.			MH002	2631	Mount Hayes	Meta	2630	Mzsa
mgsh	Migmatitic schist	Cretaceous?	Grades from schist and amphibolite (unit sa) containing diffuse granitic dikes concordant to schistosity, to contorted and partly assimilated schist and amphibolite.		K-Ar ages range from 31.9 to 65.9 Ma, hornblende ranging from 58.5 to 65.9 Ma and biotite from 31.9 to 56.9 Ma.	MH002	2630	Mount Hayes	Meta	2630	Mzsa
sq	Schist, quartzite, and amphibolite	Triassic?	Unit of relatively older calc-silicate schist, quartzite, and amphibolite. Moderately to intensely deformed with a moderate schistosity. Fine- to medium-grained. Evidence suggests calc-silicate schist and amphibolite developed from marl.	Lithologically similar rocks in Healy quadrangle to west contain Pennsylvanian to Triassic conodonts and fragments of late Triassic bivalves.		MH002	5207	Mount Hayes	Meta	5207	Trcs
msh	Quartz-mica schist, calc-schist, and amphibolite	Late Jurassic or older	Chiefly quartz-mica schist, amphibolite, and calc-schist. Protoliths chiefly pelite, sandstone, graywacke, and minor marl, andesite, and gabbro. Intensely deformed, with a strong schistosity. Metamorphosed to amphibolite facies.		K-Ar analyses of biotite and muscovite range from 30.6 to 48.0 Ma, Single hornblende yielded age of 69.6 Ma.	MH002	5206	Mount Hayes	Meta	5206	Mzpca
mph	Phyllite	Late Jurassic or older	Chiefly fine-grained white mica-quartz phyllite, and minor quartz-plagioclase-white mica phyllite, clinozoisite-chlorite-quartz phyllite, calcite-chlorite phyllite, and quartz-rich marble and metaandesite. Protoliths chiefly siltstone, metavolcanic siltstone, marl, limestone, and andesite. Intensely deformed, with a strong schistosity. Metamorphosed to upper greenschist facies.			MH002	5215	Mount Hayes	Meta	5215	Mzpca
ma	Argillite and metagraywacke	Late Jurassic or older	Chiefly argillite, metagraywacke, and metaandesite locally. Protoliths of siltstone, calcareous mudstone, and volcanic graywacke. Unit strongly schistose. Metamorphosed to lower greenschist facies.			MH002	5210	Mount Hayes	Meta	5210	Mzpca

Rock unit	Unit hame	Age	Description	Fossil	Radiometric age	Source code	Class code	Quadrangle	Rock class	NSA class	Label
csv	Schistose metasedimentary and metavolcanic rocks.	Late Triassic	Chiefly fine-grained quartz-white mica-schist, chlorite-calcite-quartz schist, marble, greenstone, and sparse metadacite. Protoliths of quartz-siltstone, calcareous silty sandstone, limestone, fine-grained basalt, and fine-grained dacite. Unit exhibits a weak schistosity striking northeast to east and dipping moderately to steeply northward.	Correlative rocks in southeast Healy quadrangle contain Heterastridium sp. of Late Triassic age.		MH002	4410	Mount Hayes	Meta	4410	Trnm
umm	Ultramafic and mafic igneous rocks occurring along Broxson Gulch thrust	Cretaceous to Triassic?	Chiefly dunite, olivine-clinopyroxene cumulates, serpentinite, metagabbro, and metadiabase. Unit occurs in scattered fault bounded exposures. Local, low-grade metamorphism.		K-Ar ages on hornblende in gabbro dikes of 91.9 and 97.7 Ma	MH002	4891	Mount Hayes	Ign	4891	Mzum
JTrm	McCarthy Formation	Early Jurassic and Late Triassic	Chiefly rhythmically, thin- to medium-bedded, calcareous argillite and impure limestone, mainly spiculitic, skeletal, or intraclastic lime packstone. Estimated maximum thickness of a few hundred meters.	Monotis M. subcircularia(?) of Late Triassic age		MH002	3820	Mount Hayes	Sed	3820	JTrmc
ga	Gabbro, diabase, and metagabbro	Late Triassic?	Chiefly hornblende gabbro, clinopyroxene gabbro, and hornblende-clinopyroxene gabbro and sparse quartz gabbro and hornblende quartz diorite. Dark-gray, fine- to medium-grained, and mainly relict hypautomorphic granular texture, but locally porphyritic, ophitic to subophitic, and diabasic. Locally intensely metamorphosed and weakly schistose. In some areas, may be late Paleozoic in age and part of the Slana Spur Formation and Tetelna Volcanics.			MH002	4320	Mount Hayes	Ign	4320	Trgb
cu	Cumulate mafic and ultramafic rocks	Late Triassic?	Chiefly consists of 1) fault-bounded lenses of olivine-cumulate and olivine-pyroxene cumulate in Slana River subterrane, and 2) large sills of olivine cumulate, olivine-pyroxene cumulate, and pyroxene-plagioclase cumulate in Tangle subterrane. Include Fish Lake Complex of Stout (1976). Locally intensely metamorphosed to lower greenschist facies exhibiting granoblastic texture.			MH002	4321	Mount Hayes	Ign	4321	Trgb
KJs	Marine metasedimentary rocks	Early Cretaceous and Late Jurassic	Principally deep-marine turbidite deposits consisting of graded beds of metamorphosed dark-gray to gray argillite, siltstone, and graywacke, pebbly graywacke, pebble to cobble conglomerate, and sparse andesite. Graded beds well-developed locally; consist of rhythmically alternating units that range from 1 cm to more than 30 cm in thickness. Unit locally intensely faulted and isoclinally folded. Local weak to moderately developed schistosity. Metamorphosed to lower greenschist facies.	Late Jurassic megafossils, locally abundant Buchia in Nabesna quadrangle.		MH002	2970	Mount Hayes	Meta	2970	KJfm

Rock unit	Unit hame	Age	Description	Fossil	Radiometric age	Source code	Class code	Quadrangle	Rock class	NSA class	Label
Trl	Limestone	Late Triassic	Chiefly dark- to light-gray micrite, dismicrite, or microsparite. Conformably overlies Nikolai Greenstone (unit Trn). Fine- to medium-grained, medium- to massive-bedded containing lenses and nodules of gray and black chert and irregular patchworks of disseminated fine-grained quartz. Generally metamorphosed to lower greenschist facies.	Locally contains moderately abundant Late Triassic mega- and microfossils.		MH002	4030	Mount Hayes	Sed	4030	JTrlm
Trn	Nikolai Greenstone	Late Triassic	Chiefly massive dark-gray-green, dark-gray-brown, reddish-brown, and maroon-gray subaerial, amygdaloidal basalt flows, separated locally by thin beds of reddish-brown nonmarine volcaniclastic rocks. Unit pervasively metamorphosed to lower greenschist facies. Disconformably overlies Eagle Creek Formation (unit Pe), overlain by Upper Triassic limestone (unit Trl). In southeastern Mount Hayes quadrangle, unit locally composed of Middle Triassic shale, limestone, and chert.			MH002	4420	Mount Hayes	Meta	4420	Trn
Pe	Eagle Creek Formation	Early Permian	Chiefly conformable sequence of alternating marine argillite and limestone. Divided into either an upper argillite and lower limestone unit in south central part of Mount Hayes quadrangle or two limestone and two argillite units in the eastern part of the quadrangle. Unit metamorphosed mainly to greenschist facies	Abundant mega- and microfossils, mainly brachiopods, corals, and foraminifers, indicated an Early Permian age		MH002	5950	Mount Hayes	Meta	5950	Pe
Pi	Shallow-level intrusive stocks, dikes, sills, and small plutons.	Early Permian?	Sparse to locally abundant andesite, and lesser dacite and rhyolite, stocks, sills, and dikes that intrude Slana Spur Formation and Tetelna Volcanics. Granoblastic overprint metamorphic texture with local weak schistosity. Metamorphosed to lower greenschist facies. Local intense hydrothermal alteration.			MH002	5860	Mount Hayes	Ign	5860	Pmi
PaPs	Slana Spur Formation	Early Permian to Middle Pennsylvanian	Chiefly a thick sequence of marine calcareous and noncalcareous volcaniclastic rocks and lesser limestone, tuff, and volcanic breccia. Disconformably overlies Tetelna Volcanics. Correlative with volcaniclastic member of Station Creek Formation of Skolai Group. Lower greenschist facies metamorphism.	Megafossils and microfossils, mainly brachiopods, corals, and foraminifers, range from Middle Pennsylvanian through Early Permian.	K-Ar age on hornblende from a weakly metamorphosed mafic nodule was 94.4 Ma, possible age of low-grade regional metamorphism of Wrangellia terrane.	MH002	5620	Mount Hayes	Meta	5620	Pat
PaPsu	Slana Spur Formation -- Calcareous volcaniclastic rocks member	Early Permian to Middle Pennsylvanian	Predominantly gray-green, clastic, locally fossiliferous limestone and marble, and gray-green coarse-grained calcareous volcanic sandstone. Includes minor volcanic conglomerate, light-gray-green lailli tuff, and andesite. Metamorphosed to lower greenschist facies.			MH002	5621	Mount Hayes	Meta	5621	Pat

Rock unit	Unit hame	Age	Description	Fossil	Radiometric age	Source code	Class code	Quadrangle	Rock class	NSA class	Label
PaPsl	Slana Spur Formation -- Volcaniclastic rocks member	Early Permian to Middle Pennsylvanian	Dark-gray, dark-green, and maroon volcanic and volcaniclastic rocks. Chiefly volcanic flows interbedded with lapilli tuff, volcanic breccia, graywacke, argillite, and limestone to marble. Local massive to bedded conglomerate, graywacke, and siltstone. Metamorphosed to lower greenschist facies.			MH002	5631	Mount Hayes	Meta	5630	PPasc
Pat	Tetelna Volcanics	Pennsylvanian	Chiefly dark-green, dark-gray-green, and purplish-gray-green volcanic flows, mud and debris avalanches, locally graded, and lapilli-pumice tuff interbedded with fine- to coarse-grained volcaniclastic rocks. Flows mainly andesite, unit metamorphosed to lower greenschist facies. Correlative with volcanic flows member of the Station Creek Formation of the Skolai Group.			MH002	6120	Mount Hayes	Meta	6220	Pat
Pag	Granitic plutons south of Denali fault	Pennsylvanian	Chiefly granite. Generally medium-grained hypautomorphic granular texture, locally porphyritic.		U-Pb zircon age of 309 Ma, interpreted as intrusive age. K-Ar hornblende age of 326 Ma of granodiorite at Rainbow Mountain, older than wall rocks at locality.	MH002	6110	Mount Hayes	Ign	6110	PPagi
Trl	Limestone	Late Triassic	Fine- to medium-grained, medium- to massive-bedded limestone. Generally calcite clasts in a very fine-grained matrix of calcite and quartz. Moderately to highly recrystallized, locally weakly schistose.	Late Triassic cephalopods and pelecypods.		MH002	4030	Mount Hayes	Sed	4030	JTrlm
Trnf	Nikolai Greenstone -- Subaerial basalt flows member	Late Triassic	Chiefly dark gray-green, gray, purple, black, or brown, massive amygdaloidal basalt flows. Fine- to medium-grained. Includes sparse basaltic breccia and basaltic aquagene tuff and sparse limestone, siltstone, shale, and chert occur in south-central part of Mount Hayes quadrangle. Unit metamorphosed to lower greenschist facies			MH002	4421	Mount Hayes	Meta	4421	Trn
Trnp	Nikolai Greenstone -- Pillow basalt flows member	Late Triassic	Chiefly interlayered dark gray-green pillow basalt flows and minor basaltic flow breccia, aquagene and epiclastic tuff, breccia, argillite, and radiolarian chert. Unit metamorphosed to lower greenschist facies.	Middle or Late Triassic Daonella or Halobia in one locality.		MH002	4422	Mount Hayes	Meta	4422	Trn
Pzt	Aquagene tuff, argillite, limestone, chert, andesite tuff, and greenstone	Late Paleozoic	Chiefly andesite flows, mud and debris avalanche deposits, and tuff interbedded with fine- to coarse grained volcaniclastic rocks. Contains lesser interlayered basaltic aquagene tuff, gray-green andesite tuf, gray-green basalt, dark-gray siliceous argillite, light-gray to white calcite, limestone, and marble, and red and black chert. Unit generally granoblasitc, locally weaklly schistose; metamorphosed to lower greenschist facies.	Fragements of Late Paleozoic bryozoans. Correlative unit in Talkeetna Mountains D-2 quadrangle contains Early to Late Permian conodonts.		MH002	5630	Mount Hayes	Meta	6120	Pat

Rock unit	Unit hame	Age	Description	Fossil	Radiometric age	Source code	Class code	Quadrangle	Rock class	NSA class	Label
mha	Metamorphosed hornblende andesite	Late Paleozoic?	Porphyritic hornblende andesite metamorphosed mainly to lower greenschist facies. Metamorphic grade increases to lower amphibolite facies adjacent to metamorphosed granitic and gabbroic plutons; later retrogressed to lower greenschist facies. Schistosity strikes east-west and dips steeply to vertically, parallel to Paxson Lake fault.			MH002	5550	Mount Hayes	Meta	5550	PPast
Q	Undifferentiated surficial deposits	Quaternary	The deposits include alluvium, colluvium, talus, landslides, rock glaciers, eolian and paludal deposits, and a variety of lacustrine, morainal, and ice contact.			VA002	100	Valdez	Unconsol	100	Qs
Tif	felsic to intermediate hypabyssal intrusive rocks	Tertiary	Dikes, sills, and small stocks, compositionally diverse, dacite predominates but rocks range from rhyodacite to quartz latite and andesite.		K-Ar age of 47 and 52 Ma reported as well as numerous 40 to 50 Ma ages and some as young as Pliocene.	VA002		Valdez	Ign	1007	Thf
QTw	Wrangell Lava	Quaternary and Tertiary?	At least 2,000 m of flows, tephra, and minor sedimentary rocks in northeastern Valdez quadrangle. Consists of mainly pyroxene andesite but ranges from basalt to dacite.		Dates as old as 2.7 to 10 Ma in adjacent Nabesna quadrangle, thought to be largely Quaternary in Valdez quadrangle.	VA002	455	Valdez	Ign	455	QTw
Kb	Berg Creek Formation	Early Cretaceous	Marine clastic rocks consisting of calcareous conglomerate, conglomeratic sandstone and siltstone, and calcarenite. Basal strata generally are pebble, cobble, and boulder conglomerate consisting of clasts derived from nearby bedrock.	Inoceramus		VA002	2110	Valdez	Sed	2110	Kbc
Js	Unnamed Jurassic marine sedimentary rocks	Middle Jurassic (Callovian)?	Marine clastic rocks consisting mostly of sandstone, siltstone, and mudstone, which contain many interbeds of pebble- and cobble-conglomerate. Greenish-gray sandstone predominates in lower part of the sequence, in many places it is calcareous and cross-stratified. Highest rocks in the sequence include rusty-gray weathering limey siltstone interbeds and concretions. Rock strata in upper part are tightly folded into southeast-striking chevrons and isoclines	Unnamed Callovian fossils		VA002	3120	Valdez	Sed	3120	Juc
Jk	Kotsina Conglomerate	Middle or Late Jurassic?	Well-indurated massive to very thick-bedded cobble- and pebble-conglomerate, with some bouldery strata. Olive-gray lithic and feldspathic sandstone, siltstone, and carbonaceous shale are interbedded in many places and increase in proportion west of Long Glacier.	Plant scraps	K-Ar age on biotite from a clast of 161 Ma and on hornblende from cross-cutting dike of 145 Ma	VA002	3110	Valdez	Sed	3110	Jkt
JTrm	McCarthy Formation -- lower member	Early Jurassic? and Late Triassic (Norian)	Marine limestone, shale, and chert. Lower member consists of interbedded finely-laminated, dark-gray, impure limestone, subordinate fissile shale, and minor chert.	Monotis and both calcareous and silicieous microfossils.	Minimum age from intruding granodiorite of 144 Ma	VA002	3821	Valdez	Sed	3821	JTrmc

Rock unit	Unit hame	Age	Description	Fossil	Radiometric age	Source code	Class code	Quadrangle	Rock class	NSA class	Label
Trl	Chitistone and Nizina Limestones	Late Triassic (Karnian and Norian)	Light- to medium-gray limestone of diverse textural varieties and include minor dolomite lower in the sequence and nodules and lenses of dark-gray chert high in the sequence. Lower thicker-bedded sequence is Chitistone Limestone, upper, thinner-bedded sequence is Nizina Limestone.			VA002	4030	Valdez	Sed	4030	JTrlm
Trn	Nikolai Greenstone	Middle and (or) Late Triassic	Weakly metamorphosed, lightly altered tholeiitic basalt that is characteristically amygdaloidal and poorly bedded. Metamorphosed to prehnite-pumpellyite facies		K-Ar whole-rock isochron of 112 +/- 11 Ma thought to indicate collosion of Wrangellia with North America	VA002	4420	Valdez	Ign	4420	Trn
Pzs	Skolai Group - greenstone unit	Late Paleozoic, Middle Pennsylvanian to Early Permian	Diverse Upper Paleozoic volcanic, volcaniclastic, and marine sedimentary rocks. Unit consists largely of two lithologies, map unit Pzs is dark, greenish-gray poorly bedded greenstone, characterized by prehnite-pumpellyite mineral assemblages, locally retaining relict pillows and map unit Pzm is subordinate light- or medium-gray and buff calcareous rocks, mostly recrystallized to marble but containing scanty fragments of fossils, interbedded with minor dark-gray calcareous siltstone and shale.			VA002	5631	Valdez	Meta	6220	Pat
Pzm	Skolai Group -- marble unit	Late Paleozoic, Middle Pennsylvanian to Early Permian	Subordinate light- or medium-gray and buff calcareous rocks, mostly recrystallized to marble but containing scanty fragments of fossils, interbedded with dark-gray calcareous siltstone and shale. Change unit designator to ma, per Winkler (1998)	Scanty fragments of bryozoans, crinoids, corals, and brachiopods.		VA002	5620	Valdez	Meta	5955	Pzskm
Psm	Strelna Metamorphic Complex	Mesozoic or Paleozoic	A diverse and intimately mixed group of low- to medium-grade greenschist and amphibolite which also includes abundant pelitic and psammitic schist, metachert, and gneiss having pronouced mortar structure. Contains no marble but does contain extensive massive to gneissose mafic to intermediate (meta?) plutonic rocks. Rocks are tightly folded on all scales and pervasively faulted; they are strongly foliated and partially mylonitic and are cut by post-metamorphic Late Jurassic and Early Cretaceous plutons. Has been thought to metamorphosed equivalent of the Strelna Formation or the Skolai Group, however it lacks any meta-limestone as would be expected for the Skolai Group. Unit is also similar to Triassic and Jurassic diorite complex of the Nabesna quadrangle.		K-Ar age on hornblende from metagabbro of 152 +/- 6 Ma; thought to be reset.	VA002	5209	Valdez	Meta	5920	PPast
Tg	Granite and granodiorite	Tertiary? (Eocene?)	Two small discordant stocks of biotite-hornblende granite and granodiorite. Unfoliated, fine- to medium-grained hypiomorphic granular rocks. Equal proportions granite and granodiorite.			VA002	1305	Valdez	Ign	1300	Tgr

Rock unit	Unit hame	Age	Description	Fossil	Radiometric age	Source code	Class code	Quadrangle	Rock class	NSA class	Label
Jc	Chitina Valley batholith	Late Jurassic	Weakly to strongly foliated compositionally diverse plutonic rocks. Dominant lithology is fine-to medium-grained hypiomorphic granular quartz monzodiorite, but quartz diorite, tonalite, and granodiorite are nearly as abundant.		K-Ar hornblende ages range from 147 +/- 7 to 157 +/- 8 Ma, biotite ages are 134 and 144 +/- 7 Ma; one mineral pair is slightly discordant.	VA002	3403	Valdez	Ign	3403	Jqd
Pzg	Gabbro and leucogabbro	Late Paleozoic, Permian to Pennsylvanian	Gabbroic rocks rocks consisting of sills, dikes, and discordant plutons. Medium- to coarse-grained, massive to foliated, altered gabbro, leucogabbro, and minor diorite. Coextensive with layered gabbro in the McCarthy quadrangle.		K-Ar age on actinolitic amphibole of 246 +/- 12 Ma, thought to be minimum age, may be partially reset by intrusion of nearby Late Jurassic hornblende granodiorite pluton.	VA002	5460	Valdez	Ign	5460	Pagb
Klc	Schist of Liberty Creek	mid-Cretaceous? or Jurassic??	Well-foliated, multiply-deformed greenschist and transitional blueschist facies mafic metavolcanic and metasedimentary rocks. Schistocity is well-developed although primary sedimentary or volcaniclastic features are retained locally. There are no marker strata and units do not persist laterally.			VA002	3610	Valdez	Meta	3610	Jsch
Kbc	Bernard Creek terrane, deleted, now McHugh Complex	mid-Cretaceous?	Mylonitic greenschist. Relict bedding and volcaniclastic textures are retained locally. Elsewhere unit is nearly massive, but cataclasis and neomineralization generally are so pervasive that they obliterate any primary features.			VA002	2190	Valdez	Meta	2190	Kmk
Kfc	Fox Creek terrane Unit deleted on new VA map	mid-Cretaceous?	Intercalcated lower greenschist and transistional blueschist facies metasedimentary and mafic metavolcanic rocks. Over broad areas the rocks have a cataclastic fabric, locally relict primary sedimentary and volcaniclastic textures are retained. Unit is distinguished from Bernard Creek terrane (unit Kbc) by the dominance of dark, very-fine-grained metapelitic rocks; where green metavolcanic rocks are present in the Fox Creek terrane they indistinguishable from greenschist of the Bernard Creek terrane.			VA002	2700	Valdez	Meta	2700	Kvs
Khc	Haley Creek terrane	mid-Cretaceous?	Metamorphosed complexly deformed and tectonically mixed plutonic and sedimentary rocks. Metaplutonic rocks are most abundant in southern part of the terrane and are compositionally diverse and weakly to strongly foliated. Although diorite and granodiorite are most abundant lithologies, compositions range from trondjhemite to hornblende gabbro and hornblendite. Amphibolite is is widespread within the metaplutonic rocks. Metasedimentary rocks are dominant in northern part of terrane where marble, metapelite, metapsammite are structurally mixed with subordinate metaplutonic rocks.			VA002	2601	Valdez	Meta	2600	Kmi

Rock unit	Unit hame	Age	Description	Fossil	Radiometric age	Source code	Class code	Quadrangle	Rock class	NSA class	Label
Kag	Haley Creek terrane - metaplutonic rocks	mid-Cretaceous?	Metamorphosed complexly deformed and tectonically mixed plutonic and sedimentary rocks. Metaplutonic rocks are most abundant in southern part of the terrane and are compositionally diverse and weakly to strongly foliated. Although diorite and granodiorite are most abundant lithologies, compositions range from trondjhemite to hornblende gabbro and hornblendite. Amphibolite is is widespread within the metaplutonic rocks.		K-Ar ages on hornblende range from 122 to 148 Ma. A muscovite age is 133 +/- 4 Ma	VA002	2600	Valdez	Meta	2600	Kmi
M	Haley Creek terrane - schistose marble	mid-Cretaceous?	Schistose marble. Individual marble layers can be traced for several km, however the layers vary greatly in thickness, terminate abruptly in places, and are generally thoroughly folded. Small isolated bodies of marble mark unmapped fault within the Haley Creek terrane.		K-Ar ages on hornblende range from 122 to 148 Ma. A muscovite age is 133 +/- 4 Ma	VA002	2720	Valdez	Meta	2720	PPaskm
Tif	Hornblende andesite or dacite dikes	Eocene	Porphyritic hornblende andesite or dacite dikes			VA002		Valdez	Ign	1105	Tva
Tt	Altered biotite and hornblende tonalite	Eocene	Small, sericitized hornblende-biotite tonalite plugs. Rocks are fine- to medium-grained sericitized tonalite with minor quartz diorite and granodiorite. In most sample, muscovite replaces biotite or has formed from alteration of plagioclase.		K-Ar hornblende 46.6 +/- 1.4 and muscovite of 52.4 +/- 2.6 Ma	VA002	1310	Valdez	Ign	1310	Tegr
Jgl	Hornblende gabbro and leucogabbro	Early Jurassic or older	Layered gabbro and leucogabbro; layered gabbro is dominantly hornblende gabbro; hornblende-augite gabbro is common, however, with the hornblende replacing or molded upon the augite; and layers and lenses of hornblendite occur at several places. Mafic part of the Tonsina Complex (now shown on Winklers map as Jtg).		K-Ar ages on hornblende of 419+/- 21, 188 +/- 8, and 171 +/- 5 Ma; the older age is considered suspect.	VA002	3540	Valdez	Ign	3540	Jmu
Jum	Ultramafic rocks	Early Jurassic or older	Dunite, harzburgitic dunite, wehrlite, websterite, and clinopyroxenite comprise the Tonsina ultramafic complex. The rocks are folded but not intensely sheared or serpentinized.			VA002		Valdez	Ign	3545	Jmu
Kmu	Matanuska Formation -- upper part	Late Cretaceous -- mid-Coniacian to Maestrichtian	A very thick sequence of marine siltstone, claystone, and sandstone in interbedded with lenticular and channelized deposits of sandstone and conglomerate. Contact with lower part of unit presumed to an unconformity. Deposition thought to occur on the fringes of a deep-sea fan. Thinly interbedded siltstone, claystone, and sandstone, which predominate, represent deposition in interchannel areas; whereas thick beds and lenses of sandstone and conglomerate represent distributary channels.			VA002	2011	Valdez	Sed	2010	Km
Kml	Matanuska Formation -- lower part	Late Cretaceous -- late-early-Albian, Cenomanian, Turonian, and early Coniacian	Marine siltstone, shale, sandstone, and pebbly sandstone are interbedded with subordinate silicieous, foraminiferal shale and fine-grained zeolitized sandstone. Contact with upper part of unit (unit Kmu) presumed to be an unconformity and is angular unconformity with the lower Talkeetna Formation (unit Jtk).			VA002	2012	Valdez	Sed	2010	Km

Rock unit	Unit hame	Age	Description	Fossil	Radiometric age	Source code	Class code	Quadrangle	Rock class	NSA class	Label
Jtk	Talkeetna Formation	Early Jurassic	Marine and non-marine andesitic and basaltic tuff, tuff breccia, and volcanogenic sedimentary rocks. Small, isolated bodies of light- to dark-gray unfossiliferous saccharoidal limestone may be parts of the units in the Valdez quadrangle.	Mollusks and brachiopods		VA002	3250	Valdez	Ign	3250	JTrtk
Jgr	Biotite-epidote granite	Middle Jurassic	Irregularly shaped small stocks of pink-weathering medium-grained granite. Green biotite and granular to coarse-grained epidote are constant accessories			VA002	3401	Valdez	Ign	3401	Jgr
Jgd	Biotite-hornblende granodiorite	Middle Jurassic	Irregularly shaped small stocks of pink-weathering medium-grained granite. Green biotite is a constant accessory; hornblende and epidote are less abundant and are not present in all samples.			VA002	591	Valdez	Ign	3402	Jgd
Jmp	Mafic plutonic complex	Early or Middle Jurassic	Consists dominantly of layered hornblended-pyroxene gabbro and leucogabbro, with minor ultramafic, dioritic, and tonalitic rocks. The southern margin of complex is a major fault zone; cataclastic modification of mineral layering in the complex near the fault zone is severe; in many places the complex is thoroughly sheared and includes boudins of country rock. Mylonitic layering is also conspicious along a a major east-west fault within the complex.		K-Ar ages on low-potassium hornblende and chloritized biotite range from 153 to 171 Ma.	VA002		Valdez	Ign	3480	Jan
Ju	Ultramafic rocks	Jurassic?	Serpentized pyroxenite? Occurs within mafic plutonic complex (unit Jmp), generally localized in strongly sheared zones. Many areas of unit are too small to map.			VA002	3345	Valdez	Ign	3345	Jmu
Tov	Orca Group -- volcanic rocks, undivided	Paleocene and Eocene?	Tholeiitic pillow basalt, pillow breccia, and minor aquagene tuff. Thin sequences of dray-gray argillite and siltstone are interbedded with the volcanic rocks and locally compressed between pillows. Volcanic rocks are exclusively of oceanic tholeiite and are conformable with enclosing flyschoid sedimentary rocks.			VA002	1135	Valdez	Ign	1135	Tov
Tos	Orca Group -- sedimentary rocks, undivided	Paleocene and Eocene?	Marine argillite, siltstone, sandstone, and conglomerate. Argillite and siltstone are more abundant the coarser-grained rocks. Well-bedded, repetitive finer-grained and coarser-grained strata; primary sedimentary features are diagnostic of deposition by sediment-gravity flow. Finer-grained facies dominate west of Valdez Arm. Conglomerate clasts are of diverse extrabasinal lithologies.			VA002	950	Valdez	Sed	950	Tos

Rock unit	Unit hame	Age	Description	Fossil	Radiometric age	Source code	Class code	Quadrangle	Rock class	NSA class	Label
Toc	Orca Group -- conglomeratic sedimentary rocks	Paleocene and Eocene?	Very poorly bedded conglomeratic sandstone and argillite mantle the tops of volcanic sequences. Conglomeratic rocks are very poorly sorted; clasts vary in size from granules to boulders and are supported by matrix. Basal parts of conglomeratic frequently contain angular to partly rounded clasts of basalt identical to substrate. Gradationally upward, the conglomeratic strata contain fewer volcanic clasts, but all other clasts are of lithologies that may be intrabasinal, in contrast to other conglomeratic beds in the Orca Group.			VA002	952	Valdez	Sed	952	Toc
TKm	Orca Group -- melange	Tertiary or Cretaceous	Consists of extensive serpentinized ultramafic rocks including dike-like bodies of rodingite, as well as blocks of layered gabbro, crossite schist, pillow basalt, marble, chert of probable Late Triassic or Early Jurassic age, and diverse metamorphosed and virtually unmetamorphosed sedimentary rocks, including conglomerate that resembles lithologies within the Ckickaloon Formation of Paleocene age.			VA002		Valdez	Melange	1790	TKmx
Kvv	Valdez Group -- Metavolcanic rocks, undivided	Late Cretaceous	Mafic metatuff and minor massive or weakly foliated greenstone having rarely preserved vague pillow shapes. Lower greenschist facies metamorphism. Most of these metavolcanic rocks are schistose and the metavolcanic are often the loci of intense deformation in the Valdez Group.		K-Ar whole-rock age on metatuff of 53.5 +/- 1.6 Ma is thought to date matamorphism.	VA002	2705	Valdez	Meta	2705	Kvv
Kvs	Valdez Group -- Metasedimentary rocks, undivided	Late Cretaceous	Weakly to strongly foliated marine argillite, siltstone, sandstone, and conglomeratic sandstone. Lower greenschist facies metamorphism. Probable volcanic source terrane.	Maestrichtian pelecypods collected outside of Valdez quadrangle.		VA002	2700	Valdez	Meta	2700	Kvs
Kvm	Valdez Group -- Phyllite and schist. Delete unit on new VA map	Late Cretaceous	Low-grade metamorphosed (lower greenschist facies) pelitic rocks consisting of homogeneous phyllite and schist. These rocks shown much stronger foliation than the undivided metasedimentary rocks (unit Kvs) of the Valdez Group. Probable volcanic source terrane.			VA002	2701	Valdez	Meta	2700	Kvs
KJm	McHugh Complex	Early Cretaceous and Jurassic?	Pervasively deformed assemblage of diverse lithologies (melange). Lithologies include gabbro, greenstone, marble, wacke, and diverse plutonic and metamorphic rocks including blueschist. Rocks occur in three discrete belts, the northernmost which yields Triassic radiolarians, a medial belt yielding Jurassic and Cretaceous age, and a southernly belt yielding radiolaria as young mid-Cretaceous age. Rocks typically shown prehnite-pumpellyite facies metamorphism.	Radiolaria from chert ranges from Triassic to mid-Cretaceous (Albian or Cenomanian).		VA002	2190	Valdez	Melange	2190	Kmk
Jgb	Greenschist and transitional blueschist	Jurassic	Chiefly intercalated greenschist and blueschist, but includes lawsonite, muscovite, or actinolite schist, carbonaceous schist, highly siliceous rocks containing stilpnomelane, and foliated calcareous rocks. Similar to Raspberry, Seldovia, and Knik River schist unit.		K-Ar ages on crossite and muscovite range from 152 to 175 Ma, thought to be metamorphic ages.	VA002		Valdez	Meta	3610	Jsch

Rock unit	Unit hame	Age	Description	Fossil	Radiometric age	Source code	Class code	Quadrangle	Rock class	NSA class	Label
Ja	Amphibolite facies rocks	Jurassic(?)	Portion of tectonic inclusion 10 by 15 km in McHugh Complex consisting of layered quartz gabbro, amphibolite, and orthogneiss. This unit consists of nondescript, amphibolite facies, weakly foliated to nonfoliated granular rocks of uncertain protolith. Many of the rocks are rich in feldspar and quartz and may have a sedimentary protolith. They are laced with numerous dike-like bodies of amphibolite that originate from underlying amphibolite and orthogneiss. The amphibolite-facies rocks are structurally complex and contain many lenses of incompletely serpentinized ultramafic and gabbroic rocks. Extensively retrograded to prehnite-pumpellyite facies, as is surrounding McHugh Complex. Changed to Strelna per Winkler, 1998.			VA002	5920	Valdez	Meta	5920	PPast
Jag	Uranatina River metaplutonic unit	Jurassic and Middle Pennsylvanian	Portion of tectonic inclusion 10 by 15 km in McHugh Complex consisting of layered quartz gabbro, amphibolite, and orthogneiss. This unit consists of compositionally banded very mafic amphibolite to hornblende-biotie dioritic and quartz dioritic gneiss. Contains lenses of pyroxenite as much as 2 m across. Foliation of the rocks is swirled or tightly folded in many places and large hornblende or hornblende-plagioclase pods have grown in the hinges of many folds. Most of unit is likely of Jurassic age but is known to contain at least locally Middle Pennsylvanian metagranodiorite.		Low-potassium hornblende yielded K-Ar age of 267 +/- 8 Ma (mid-Permian), thought to approximate time of metamorphism.	VA002	5245	Valdez	Meta	5245	JPaur
Jlg	Layered quartz gabbro	Jurassic	Conspicously layered, hypiodiomorphic-granular textured quartz gabbro. Layers enriched in clinopyroxene or in plagioclase and quartz give unit its prominent banded appearance. Prehnite-pumpellyite metamorphosed, little deformed and dips quite uniformly northward.		K-Ar age on pyroxene of 185 +/- 19 Ma is highly suspect, however matches ages on Afognak Pluton, the pluton of the Barren Islands and reputed ages on small dioritic plutons near Seldovia.	VA002		Valdez	Ign	3340?	Jmu
Qp	Placer mine tailings	Holocene (Historic)	Symmetrical to irregular piles of artificially water-worked, sorted gravel and in situ slab rock derived from bedrock.			ID002	100	Iditarod	Unconsol	100	Qpm
QTs	Surficial deposits	Holocene to Pliocene(?)	Unconsolidated fluvial, terrace, colluvial, glacial, and eolian deposits, usually covered by vegetation. Deposits range between 3 and 20 m thick and generally contain permafrost to some degree. Unit primarily Pleistocene to Holocene in age, however stream gravel terraces from other unglaciated areas elsewhere in Alaska have yielded Pliocene pollen and it is possible other terraces in the map area may also.			ID002	100	Iditarod	Unconsol	100	Qs
Tb	Basaltic andesite	Tertiary -- Miocene	Very fine grained to aphanitic, dark- to medium-gray, locally vesicular, augite basaltic andesite.		K-Ar whole-rock age of 6.9 and 13.0 Ma	ID002	200	Iditarod	Ign	1052	Tba

Rock unit	Unit hame	Age	Description	Fossil	Radiometric age	Source code	Class code	Quadrangle	Rock class	NSA class	Label
TKy	Volcanic rocks of Yetna River area	Tertiary and Late Cretaceous	Chiefly subaerial lava flows of andesite, dacite, rhyolite, and minor basalt and subordinate welded to nonwelded rhyolitic to andesitic ash-flow tuff.		Eight of nine samples yielded K-Ar ages between 54.4 and 68.7 Ma, ninth sample yielded age of 25.5 Ma on tuff.	ID002	301	Iditarod	Ign	1605	TKvi
TKil	Iditarod Volcanics -- Andesitic to basaltic subaerial lava flows and mafic volcanic breccia	Tertiary and Late Cretaceous	Subaerial, locally columnar-jointed, aphanitic to porphyritic, olivine-clinopyroxene basaltic andesite, clinopyroxene andesite, and minor dacite; volcanic breccia locally interfingers with flow rocks.		K-Ar ages from 4 samples ranged between 58 and 66 Ma; one whole-rock yielded a 35.1 Ma minimum age.	ID002	302	Iditarod	Ign	1605	TKvi
Kit	Iditarod Volcanics -- Tuff, volcanic breccia, altered andesitic to dacitic flows and volcaniclastic sandstone	Late Cretaceous	Heterogeneous assemblage characterized by lithic, crystal, and water-laid tuff and altered intermediate lava flows.; locally includes volcanic breccia, volcaniclastic sandstone, and lahar deposits. Lithologically identical to unit Kkt; distinguished by surrounding rocks.		K-Ar ages from 5 samples ranged between 70.3 to 76.7 Ma; two youngest are considered minimum ages.	ID002	400	Iditarod	Ign	2270	Kvl
Kkq	Kuskokwim Group - quartzose sandstone and siltstone	Late Cretaceous, (Paleocene?) Campanian to Turonian?	Quartzose sublithic sandstone, conglomerate, siltstone, and siliceous shale. Finer-grained layers locally contain abundant coaly leaf and stem debris; thin coal seams are present locally. Coquina layers composed of brackish to fresh water bivalves are locally interbedded with sandstone and siltstone. Rocks are interpreted as shallow-marine to locally nonmarine.	Dicotyedon leaf fragment of probable Turonian to Paleocene age but may be as old as Cenomanian.	K-Ar age of 77 Ma on interbedded andesite tuff in upper part of section.	ID002	401	Iditarod	Sed	1985	Kkn
Kks	Kuskokwim Group -- sandstone, siltstone, shale, and conglomerate	Late Cretaceous, Campanian? to Cenomanian?	Thick assemblage of fine- to coarse-grained lithic sandstone, micaceous siltstone, shale, and minor chert-pebble conglomerate; major part of Kuskokwim Group in quadrangle. Sandstone is lithic rich; nearly all contain metamorphic lithic fragments, but plutonic rock, sandstone, chert, limestone, and/or volcanic rock fragments are abundant locally. Finer-grained layers locally contain coaly leaf and stem fragments.	Pelecypods of Turonian or probable Turonian age but may be as old as Cenomanian based on fossils outside of Iditarod quadrangle.		ID002	402	Iditarod	Sed	1970	Kk
Kkt	Kuskokwim Group -- volcanic tuff and agglomerate	Late Cretaceous	Hetergeneous assemblage of tuff, agglomerate, cherty tuff and locally, minor sandstone. Lithologically identical to unit Kit, units only distinguished by surrounding rocks.		K-Ar ages of 69.4 and 71.3 Ma on whole rocks, questionable due to alteration.	ID002	403	Iditarod	Ign	2260	Kvl
Kka	Kuskokwim Group -- altered andesite flows, tuffs, and sills?	Late Cretaceous; Campanian	Layers of intermediate igneous rocks 1 to 5-m-thick interbedded with unit Kks. Consists of andesitic flows and tuffs, and possible sills.		K-Ar age of 77 Ma	ID002	404	Iditarod	Ign	2261	Kvl
Kkv	Kuskokwim Group -- volcanic flow(s) and tuff	Late Cretaceous	Hornblende-clinopyroxene andesitic volcanic flow(s) and chlorite-calcite altered tuff. Interbedded with unit Kks.			ID002	405	Iditarod	Ign	2261	Kvl
Ks	Sandstone and siltstone	Early Cretaceous	Medium-grained to very fine grained sandstone, tuffaceous sandstone, and siltstone only exposed as colluvial chips in western part of Iditarod quadrangle.	Age based on Hauterivian to Barremian palynomorphs in one sample.		ID002	406	Iditarod	Sed	2020	Kme

Rock unit	Unit hame	Age	Description	Fossil	Radiometric age	Source code	Class code	Quadrangle	Rock class	NSA class	Label
TrMc	Chert, volcanic rocks, metasandstone, and limestone	Triassic to Mississippian	Radiolarian chert, clinopyroxene basalt to basaltic andesite, lithic tuff, water-laid tuff, metasiltstone, and minor fossiliferous shallow-water limestone. Occurs as fault slivers? in northeastern part of Iditarod quadrangle or associated with the Dishna River fault zone in north-central part of quadrangle. Prehnite-pumpellyite metamorphism. Age based on correlation with lithologically similar rocks in Ophir quadrangle to north.	Late Triassic (or possibly Jurassic) radiolarians and conodonts and crinoidal hash no older than mid-Mississippian.	K-Ar hornblende age of 302 +/- 9 Ma on porphyritic volcanic rock; 3 K-Ar whole-rock ages on greenstones (88.4 +/- 2.7, 110 +/- 3, 76.5 +/- 2.3 Ma)	ID002	500	Iditarod	Ign	5111	TrMica
Tp	Porphyritic granodiorite plug	Early Tertiary	Granodiorite consisting of abundant phenocrysts of hornblende and plagioclase in a finer-grained, phaneritic groundmass.		K-Ar age on amphibole of 52.8 Ma	ID002	201	Iditarod	Ign	1300	Tegr
TKgp	Hypabyssal granite porphyry dikes, sills, and plugs	Tertiary and Late Cretaceous	Porphyritic to fine-grained phaneritic dikes, sills, and plugs of granitic composition.		22 K-Ar ages in two groups; 71.5 to 69.1 Ma and 65.7 to 63.5 Ma. Most reliable ages all in older group (FHW).	ID002	303	Iditarod	Ign	1602	TKgp
TKp	Pilotaxitic dacite-andesite plugs	Tertiary and Late Cretaceous	Three small bodies of subvolcanic dacite to andesite. Pilotaxitic texture to the fine-grained groundmass. Sparse phenocrysts of granophyric plagioclase and rare pyroxene.			ID002	304	Iditarod	Ign	1620	TKd
TKm	Monzonite, quartz monzonite, syenite, granodiorite, granite, and minor lamprophyre	Tertiary and Late Cretaceous	Small stocks and plutons of fine- to coarse-grained, phaneritic to hypidiomorphic, clinopyroxene-biotite +/- olivine monzonite, hornblende-clinopyroxene-biotite quartz monzonite, biotite syenite, biotite-hornblende granodiorite, biotite granite, and rare lampophyric rocks.		20 K-Ar ages have bimodal distribution, 73.2 to 68.3 Ma and 63.4 to 59.4 Ma. Many of the younger ages are suspect due to very low K2O in the biotites (FHW).	ID002	305	Iditarod	Ign	1660	TKm
TKd	Altered intermediate to mafic dikes	Tertiary and Late Cretaceous	Porphyritic biotite-clinopyroxene-plagioclase +/- olivine dikes, which are partly to extensively altered to chlorite-calcite-silica assemblages.		K-Ar age on biotite of 71.2 Ma	ID002	306	Iditarod	Ign	1601	TKd
TKg	Alkali granite	Tertiary and Cretaceous	Poorly exposed, medium-grained, granophyric alkali granite Light colored unit (CI < 7) containing varying mafic mineral assemblages, alkali amphibole-pyroxene-biotite to chloritized biotite		K-Ar age on biotite of 140 Ma, suspect due to extremely low K2O, amphibole age from adjacent Holy Cross quadrangle of 62.9 Ma	ID002	307	Iditarod	Ign	1655	TKg
Jdr	Dishna River mafic and ultramafic rocks	Jurassic	Poorly exposed mafic and ultramafic that include two-pyroxene gabbronorite, clinopyroxene-hornblende gabbro, hornblende gabbro, diabase, harzburgite, minor dunite, and rare pyroxenite. Original igneous textures well preserved in most samples, however secondary mineral assemblages indicate low-pressure hydrothermal metamorphism. Ultramafic rocks all partially to completely serpentinized.		Dubious K-Ar ages on hornblende (replicated) of 222 +/- 23 and 228 +/- 25 Ma and 92.2 +/- 2.8 Ma	ID002	600	Iditarod	Ign	5191	Jium

Rock unit	Unit hame	Age	Description	Fossil	Radiometric age	Source code	Class code	Quadrangle	Rock class	NSA class	Label
PzPlg	Greenschist, pelitic schist, and metagranite	Paleozoic and Proterzoic?	Generally poorly exposed, mixed assemblage of greenschist facies metamorphic rocks including mafic meta-igneous rocks, subordinate metasedimentary rocks (pelitic schist, phyllite, calcareous schist, and quartzite) and minor granitic orthogneiss.		K-Ar biotite age from granitic orthogneiss was 108 Ma, thought to be post-metamorphic cooling age.	ID002	700	Iditarod	Meta	8650	PzZrmc
Xi	Idono Complex	Early Proterozoic	Foliated meta-plutonic rocks, lesser amphibolite, and minor metasedimentary rocks. Compositionally diverse metaplutonic rocks are primarily biotite +/- muscovite granitic orthogneiss but include orthogneiss of tonalitic, granodioritic, quartz dioritic, and quartz monzonitic composition, minor metagabbro, and rare hornblendite. Amphibolite varies little in composition and ranges from moderately foliated to well-foliated. Metasedimentary rocks are well-foliated schists. Complex is of amphibolite facies.		U-Pb zircon age of 2.06 Ga; K-Ar ages range from approximately 120 Ma to approximately 1,230 Ma.	ID002	800	Iditarod	Meta	9400	Xi
g	Glaciers and superglacial moraine	Holocene	Exposed glacial ice locally mantled by unsorted jumbles of fresh boulders, cobbles, sand, silt, and mud as much as several meters thick.			AN002	101	Anchorage	Unconsol	101	g
Qs□	Surficial deposits	Quaternary	Widespread glacial, alluvial, colluvial, and lacustrine deposits, rock glaciers, and landslides; have not been subdivided. Glacial deposits include extensive ground, lateral and terminal moraines, and associated outwash deposited during several advances and retreats. Drift mantling Anchorage lowland almost entirely Pleistocene in age. Other surfical deposits probably Holcene age.			AN002	100	Anchorage	Unconsol	100	Qs
Ttk	Tyonek Formation	Miocene	Carbonaceous sandstone, siltstone, shale, and claystone in several isolated outcrops near the town of Eagle River and along the Little Susitna River south of the Castle Mountain fault . Maybe correlative with Tyonek Formation of upper Cook Inlet. Outcrops on Little Susitna River are stratifgraphically above the Tsadaka and Wishbone Formations but no contacts are exposed. Gradational contact between the Tyonek and the Tsadaka in the Union Oil Pittman well west of quadrangle. Maximum thickness is along axis of upper Cook Inlet, where it is more than 2300 m thick in the subsurface.	early Seldovian Stage plants remains		AN002	300	Anchorage	Sed	600	Tty
Tv	Volcanic Rocks	Miocene to Paleocene	Upper part of sequence consists of andesite and basalt flows and minor rhyolitic tuff, lithofeldspathic sandstone, and fluviatile conglomerate. Lower part consists of stocks, dikes, lenticular flows, and pyroclastic rocks, chiefly of quartz latite, and rhyolite, and minor andesite and basalt. Est. to be 1500 m thick.	Near Nelchina volcaniclastics contain Eocene plant fossils	Whole-rock K-Ar age 60 ma near middle of sequence; whole-rock ages of 54 to 56 ma from volcanic rocks in the Arkose Ridge Formation	AN002	310	Anchorage	Ign	1000	Tvu

Rock unit	Unit hame	Age	Description	Fossil	Radiometric age	Source code	Class code	Quadrangle	Rock class	NSA class	Label
Tt	Tsadaka Formation	Oligocene	Poorly sorted cobble to boulder conglomerate, consisting of plutonic clasts, interbedded with lenses of feldspathic sandstone, siltstone, and shale. Local provenance, rapid lateral lithology and thickness changes; correlative with the Hemlock Conglomerate of the Kenai Group. Angular unconformity separates it from underlying Wishbone Formation at Wishbone Hill; on Moose Creek it rests directly on Chickaloon Formation -- entire Wishbone has been eroded away. Depositional top not observed. Approximately 200 m thick.			AN002	320	Anchorage	Sed	670	Tts
Tw	Wishbone Formation	Eocene	Fluvialtile conglomerate and thick interbeds of sandstone, siltstone, and claystone, with local partings of volcanic ash. Extends at least 30 km northward intoTalkeetna quadrangle. South of Castle Mountain and Caribou faults, contact with Chickaloon Formation is generally conformable, but locally is an angular unconformity. Thickness 600 to 900 m.			AN002	330	Anchorage	Sed	870	Tw
Tc	Chickaloon Formation	Eocene and Paleocene	Fluvialtile and alluvial carbonaceous mudstone, siltstone, conglomeratic sandstone, and polymictic conglomerate. Middle and upper portions of unit contain numerous beds of bituminous coal; lower part consists of conglomerate and lithic sandstone. A local facies in the northern Chugach Mountains consists of strongly deformed poorly sorted, massive to crudely stratified cobble and boulder conglomerate grading upward into well-stratified, thick bedded sandstone and conglomerate having a chloritic matrix. This facies is more than 1200 m thick. Total thickness of unit is greater than 1500 m.	Lower part extn\ends into Paleocene based on plant leaves which correlate to flora present in the Fort Union Formation. Also palonology studies by oil industry.□	K-Ar and fission-track ages ranging from 56 to 53 Ma on ash partings from coal beds in the upper Chickaloon NW of Jonesville	AN002	340	Anchorage	Sed	900	Tch
Tar	Arkose Ridge Fomation	Eocene and Paleocene	Fluviatile and alluvial feldspathic and biotite-bearing sandstone, conglomerate, siltstone, and shale and thin beds of lignitic coal. West of Chickaloon River, lower part of formation contains intercalated basalt flows and rhyolite tuffs which may correlate to unitTv of Winkler and others (1992); outcrops north of the Caribou fault include 200 m of polymictic conglomerate which may correlate to the Wishbone Hill Formation. As much as 700 m thick.	abundant plant fragments some of late Paleocene age	metamorphic biotite age of 67.5 +/- 2.4; K-Ar whole rock dates range from 56 to46 Ma for lower part of fm.;K-Ar whole rock date of 46 Ma for a basalt dike from the middle of the fm.	AN002	350	Anchorage	Sed	890	Tar
Km	Matanuska Formation	Late and Early Cretaceous (Albian to Maestrichtian)	Fossiliferous marine shale containing conspicuous calcerous concretions and volcanic-lithic siltstone, sandstone, and subordinate conglomerate ;diverse shallow -to-deep marine (turbiditic) deposits. Upper part, at least, is coeval with the Valdez Group to the south. Greater than 4300 m thick.			AN002	400	Anchorage	Sed	2010	Km

Rock unit	Unit hame	Age	Description	Fossil	Radiometric age	Source code	Class code	Quadrangle	Rock class	NSA class	Label
Jn□	Naknek Formation	Late Jurassic (Oxfordian to late Kimeridgian)	Thin- to thck-bedded, fossiliferous marine siltstone, shale, and litho-feldspathic sandstone and conglomerate. Principally composed of pluton and volcanic detritus. Lower contact disconformable to slight angular unconformity and upper contact is unconformity.			AN002	500	Anchorage	Sed	3010	Jn
Jc	Chinitna Formation	Middle Jurassic (late Bathonian (?) and early and middle Callovian)	Shallow- marine shale, siltstone, and subordinate sandstone containing numerous large limestone concretions; incorporates volcanic and plutonic detritus from the Talkeetna arc. Disconformably overlies Tuxedni Group. Thickness varies locally but is as much as 600 m.	type not described but age late early Callovian		AN002	510	Anchorage	Sed	3030	Jc
Jt	Tuxedni Group	Middle Jurassic (Bajocian and Bathonian Stages)	Fossiliferous shallow-marine siltstone, shale, and sandstone; upper part consists of thin- to thick-bedded, dark siltstone and shale; lower part consists of thin- to thick-bedded sandstone which is pebbly in places. Lower contact is an angular unconformity. Thickness 300- 400 m, much thinner than at the type section on the Alaska Peninsula.	Three new collections range in age form early and middle Bajocian.		AN002	520	Anchorage	Sed	3180	Jtx
Jgd	Granodiorite	Middle Jurassic□□	Large, discordant, epizonal pluton and two satellitic stocks of hornblende-biotite granodiorite and lesser tonalite and quartz diorite. Plutons intrude the Talkeetna Fm. (JTrt) and quartz diortite (Jqd) and are overlain nonconformably by the Arkose Ridge Fm. (Tar).		K-Ar ages in the Talkeetna Mountains range from 173 to 168 Ma and include a concordant mineral pair. In Chugach Mountains, a date of 175 to 174 Ma by a concordant K-Ar mineral pair was obtained.	AN002	521	Anchorage	Ign	3402	Jgd
Jqd	Quartz diorite	Middle Jurassic□□	Large, disconcordant, epizonal pluton ; medium to coarse-grained hornblende (+/- biotite) quartz diorite, but also includes diorite and tonalite. Large areas have been sheared and altered. Intrudes JTrt and Jma and is intruded by Jgd and is overlain nonconformably by the Arkose Ridge Fm.		Discordant K-Ar dates of 169 to 154 Ma (minimum ages)	AN002	522	Anchorage	Ign	3403	Jqd
Jqt	Quartz diorite and tonalite	Middle Jurassic	Series of discordant intermediate plutons. They are relatively homogeneous, fine- to medium-grained quartz diorite and tonalite. Large areas are sheared and altered. Plutons intrude JTrt and Jg and are intruded by Jgd		K-Ar ages range from 181 to 167 Ma and include a concordant mineral pair; zircon fission-track ages are 186 and 170 Ma	AN002	523	Anchorage	Ign	3404	Jqt
Jmip	Mafic and intermediate plutonic rocks	Middle to Early Jurassic□□	Complexly intermixed series of mafic to intermediate plutonic rocks. Plutons consist of gabbronorite, hornblende gabbro, diorite, and tonalite. Xenoliths of gabbro show ductile deformation as though they still were warm when intruded by silicic magmas. Migmatitic textures are common at contacts between lithologies. Steeply dipping faults cut the plutons.		K-Ar on hornblende and biotite are 194 to 165 Ma. Twelve other K-Ar dates on hornblende and biotite range from 187 to 160 Ma. U-Pb zircon ages range form 183 to 171 Ma.	AN002	524	Anchorage	Ign	3405	Jmu

Rock unit	Unit hame	Age	Description	Fossil	Radiometric age	Source code	Class code	Quadrangle	Rock class	NSA class	Label
Jg	Gabbronorite	Middle to Early Jurassic□□	Fine- to coarse-grained gabbroic rocks consisting primarily of gabbronorite, leucogabbronorite, and pyroxene-hornblende gabbro, lesser hornblende gabbro, and minor anorthisitic gabbro. Primary magnetite and illmenite are abundant (as much as 15 percent) and cause a characteristic positive magentic anomaly. Correlative rocks occurr in Valdez 1 X 3 quad and extend for about 1000 km from SW of Kodiak Island to the Copper RIver.		K-Ar dates of about 177 Ma compare well with K-Ar and Ar/Ar dates from Valdez quad rocks (ranging from 181-175 Ma).	AN002	525	Anchorage	Ign	3490	Jmu
Jgs	Sheared gabbronorite	Middle to Early Jurassic□□	Intensely sheared and altered serpentinized gabbroic and ultramafic rocks. Serpentinized rocks occurr in most outcrops of gabbronorite (Jg) but have been mapped separately between the Nelchina and Matanuska Glaciers.			AN002	526	Anchorage	Ign	3491	Jmu
Jum	Ultramafic and mafic rocks	Middle to Early Jurassic □□	Cumulate ultramafics and mafics forming two large fault-bounded sequences in the northern Chugach Mountains; the Eklutna and Wolverine complexes. The Eklutna is 2-3 km thick and 11 km long. From base to top consists of chromite-bearing dunite, wehrlite, olivine clinopyroxenite, clinopyroxenite, and websterite. Associated with both positive gravity and magnetic anomalies. The Wolverine is 1-2 km thick and consists og chromite-bearing dunite grading up into clinopyroxenite. These rocks are correlative to the Tonsina sequence in the Valdez quad.		Both sequeces are undated but are intruded by dikes and plutons of Jmip.	AN002	527	Anchorage	Ign	3495	Jmu
Jma	Amphibolite and quartz diorite	Middle to Early Jurassic□□	Intricately intermixed amphibolite, foliated quartz diorite, and lesser trondhjemite. Some minor biotite-quartz-feldspar gneiss.		Correlated to rocks of the Talkeetna Moutains quad that have a K-Ar date of 176 Ma	AN002	528	Anchorage	Meta	5550	PPast
Jps	Pelitic schist	Jurassic□□	Quartz-muscovite-albite-chlorite (+/- garnet-biotite) pelitic schist. Uniform in lithology and has no correlative rocks nearby. Minerology indicates retrograded greenschist metamorphism. Age of prograde metamorphism is inferred to be Jurassic.		K-Ar on muscovite from schist ranges from 66 - 51 Ma are presumed to be reset by intrusion of TKt and TKg	AN002	529	Anchorage	Meta	3700	Jps
JTrt	Talkeetna Formation	Early Jurassic to Late Triassic□□	Andesitic, dacitic, and basaltic flows, flow breccia, tuff, shallow sills, and agglomerate. In many places contains subordinate interbedded volcaniclastic sandstone, conglomerate, and fossiliferous marine siltstone and shale. Limestone and marble bodies are mapped separately as Trl. Estimated to be 1000 to 2000 m thick but bottom contact is not exposed.			AN002	530	Anchorage	Ign	3250	JTrtk

Rock unit	Unit hame	Age	Description	Fossil	Radiometric age	Source code	Class code	Quadrangle	Rock class	NSA class	Label
JPzm	Metamorphic rocks undivided	□□	Metasedimentary and metavolcanic rocks. Strongly to weakly foliated and variably metamorphosed from greenschist to amphibolote facies. Intruded by Jmip and Jg rocks. Sedimentary protoliths include shale, chert, tuffaceous arenite, and limestone. Volcanic protoliths are most probably basalt. The diversity of protoliths may indicate tectonic mixing prior to metamorphism. Fabric of metasedimentary rocks is cataclastic or recystallized.	Fusulinids dated as Permian	Minimum age of metamorphism of 177 Ma by K-Ar on actinolite. This age may have been reset by a nearby 165 Ma pluton. Hornblende K-Ar ages of 121 and 107 Ma and a hornblende Ar/Ar plateau age of 117 Ma on mafic schist indicate resetting during metamorphism associated with intrusion of Kt.	AN002	531	Anchorage	Meta	5200	Jsch
Tmg	Granitic phase Miners Bay Pluton	Oligocene□□	Altered, medium-grained leucrocratic biotite granite pluton and associated dikes. Granitic rocks include a slightly older mafic phase (Tmm), include both the Valdez and Orca Groups, and are cut by Contact fault		K-Ar age of 32.2+/- 1.6 Ma on biotite	AN002	321	Anchorage	Ign	1270	Togr
Tmm	Mafic phase Miners Bay Pluton	Oligocene□□	Texturally and compositionaly varibale composite mafic pluton east of Unakwik Inlet. Pluton consists of medium-grained clinopyroxene +/- orthopyroxene gabbro and lesser clinopyroxene-bearing diorite. Quartz gabbro and quartz diorite occur near pluton margins, and locally contain biotite. More mafic rocks contain disseminated pyrrhotite, pentlandite, and chalcopyrite. Mafic phase intrudes the Valdez Group, is intruded by the granitic phse (Tmg) and is bounded by the Contact fault		K-Ar age of 38.4+/- 1.9 Ma on hornblende	AN002	322	Anchorage	Ign	1292	Toem
Tgg	Granite and granodiorite	Oligocene or Eocene□□	Small plutons west of Columbia Glacier and south of Wells Bay that are coextensive with the Cedar Bay Granite and numeraous leucocratic dikes that intrude the Orca Group. Plutons consist of biotite+/- hornblende rganite and granodioriteic border phases, abundant alkali-feldspar. Plutons are undated but are correlated with Eocene plutons elsewhere in eastern Price William Sound (PWS) on the basis of similar major-oxide chemistry. An alternative correlation is with dated bimodal Oligocene plutons in western PWS.		K-Ar age of 38.4+/- 1.9 Ma on hornblende	AN002	323	Anchorage	Ign	1290	Toegr

Rock unit	Unit hame	Age	Description	Fossil	Radiometric age	Source code	Class code	Quadrangle	Rock class	NSA class	Label
Tfp	Felsic Intrusions	Eocene□□	Leucocratic dikes, sills, and small stocks occurring widely south of Border Ranges fault. Only a few meters thick but laterally extensive; Dacite predominates, but rholite also is present. Intrusions usually are pophyritic with fine-to medium-grained phenocrysts of plagioclase and occasional hornblende. Generally, phenocrysts and groundmass are extensively altered to sericite and carbonate, and scare mafic minerals nearly always altered to chlorite. May correlate with hypabyssal felsic and intermediate intrusions north of the Border Ranges fault.		Two groups apparent using K-Ar and fission track: older group 55-48 Ma and younger group 44-43 Ma. Near Anchorage, a K-Ar age of 34 from a hornblende dacite dike	AN002	334	Anchorage	Ign	1301	Td
Tim	Hypayssal mafic Intrusions	Eocene□□	Small stocks and irregular-shaped dikes and sills of diorite porphyry, diabase, basalt, and lamprophyre widely exposed in the Matanuska Valley		Primative initial Sr/Sr and whole-rock K-Ar age of 41 Ma	AN002	331	Anchorage	Ign	1012	Thm
Ti	Hypayssal felsic and intermediate intrusions	Eocene□□	Small stocks and irregular-shaped dikes and sills of rhyolite, quartz latite, latite, and dacite widely exposed in Talkeetna Mountains and the Matanuska Valley. May correlate with felsic volcanic rocks in upper part of unit Tv.		Primative initial Sr/Sr indicate little crustal contamination during intrusion and 4 whole-rock K-Ar age of 46 to 38 Ma for stocks and 3 zircon fission tack ages of 41-37 Ma on felsic intrusions.	AN002	332	Anchorage	Ign	1011	Thf
TKc	Calaclasite	Eocene? and Early Cretaceous?□□	Chlorite-rich, fine-grained granular rocks formed by cataclasis and retrograde alteration of mafic and ultramafic plutonic rocks and mafic volcanic rocks; May be equivalent lithologically to sheared gabbronorite (Jgs). Lithologies and fabrics of these rocks may resemble parts of the Haley Creek metamorphic assemblage.		Deformation in the Border Ranges fault is at least as old as Early Cretaceous; however, much of the fabric may be an Eocene overprint from reactivation of the old thrust as a strike-slip boundary.	AN002	333	Anchorage	Meta	1710	TKc
TJds	Mafic and intermediate dikes, sills, stocks	Eocene? to Jurassic?□□	Numerous compositionally variable, altered dikes, sills, and small stocks intruding the Talkeetna Formation and Jurassic plutonic rocks in the Chugach Mountains. Rocks types consist of fine-grained basalt, prophyritic andesite, and dacite		Whole-rock K-Ar ages of 130 and 38 Ma for two basalt dikes	AN002	341	Anchorage	Ign	1012	Thm
TKg	Granite	early Paleocene and Late Cretaceous□□	Large, epizonal, biotite-muscovite pluton. Pluton is principally granite, but also granodiorite and lesser quartz monzonite.		K-Ar ages on muscovite and biotite 67 and 65 Ma, respectively.	AN002	410	Anchorage	Ign	1655	TKg
TKt	Tonalite	early Paleocene and Late Cretaceous□□	Large pluton of predominately biotite-hornblende tonalite and lesser biotite-hornblende quartz diorite. Pluton is epizonal or mesozonal. Weakly developed foliation occurs in many places, and orbicular textures are present locally.		K-Ar ages 73-67 Ma (possibly reset).	AN002	420	Anchorage	Ign	1660	TKm

Rock unit	Unit hame	Age	Description	Fossil	Radiometric age	Source code	Class code	Quadrangle	Rock class	NSA class	Label
Kw	Willow Creek pluton	Late Cretaceous□□	Pervasively altered, zoned pluton; based on its distincive aeomagnetic signature it is interpreted to extend at least to northern boundary of map area. Pluton has a 30- to 200-m wide outer margin of hornblende quartz diorite and lesser hornblende tonalite. Core is hornblende-biotite granodiorite, and lesser hornblende-biotite quartz monzonite and biotite quartz monzonite. Foliation is common, particularly along margins. Plutonics host mineralized veins.		Subconcordant K-Ar ages 79-72 Ma. K-Ar ages from propylitized pluton and gold-bearing veins and dikes that cut the pluton indicate episodes of alteration and quartz veining at 66 and 57 Ma.	AN002	430	Anchorage	Ign	2460	Kg
Kum	Serpentinized ultramafic rocks	Late Cretaceous□□	Small, structurally bounded, pervasively sheared, discordant bodies of serpentinized ultramafic rocks wholly enclosed in pelitic schist (Jps) near Bald Mountain Ridge.		Age of origin unknown, but early Late Cretaceous K-Ar minimum ages 91-89 Ma are presumed to date their emplacement.	AN002	440	Anchorage	Ign	2510	Kmum
Tos	Sedimentary rocks of the Orca Group	Eocene and Paleocene□□	Monotonous sequences of thin- to thick-bedded sandstone, siltstone, and mudstone. Primary sedimentary features indicate deposition by turbidity currents			AN002	342	Anchorage	Sed	950	Tos
Toc	Conglomerate of the Orca Group	Eocene and Paleocene□□	Massive, clast-supported pebble, cobble and boulder conglomerate to matrix-supported pebbly mudstone and sandstone; clasts generally are well rounded and consist entirely of sandstone and siltstone. About 900 m thick near Miners Bay.			AN002	343	Anchorage	Sed	952	Toc
Tovs	Sedimentary and volcanic rocks of the Orca Group	Eocene and Paleocene□□	Basaltic flows, pillow breccia, and tuff interbedded with fyschoid siltstone and sadstone southeast of Miners Bay. Volcanic interbeds weather a conspicuous rusty color.			AN002	344	Anchorage	Sed	951	Tovs
Kvs	Metasedimentary rocks of the Valdez Group	Late Cretaceous□□	Thick sequences of drab, rythmically alternating multiply deformed turbidites, including metasandstone, metasiltstone, argillite, slate, and phyllite, and rare beds of pebbly argillite and metasandstone; generally beds are a few centimeters to a few meters thick, but locally massive metasandstone is as thick as several tens of meters. In some places, primary sedimentary structures such as graded bedding, current-ripple cross-lamination, convolute bedding, and sole markings are preserved.			AN002	441	Anchorage	Meta	2700	Kvs
Kvt	Mafic metatuff of the Valdez Group	Late Cretaceous□□	Altered chlorite-epidote-actinolite semischist interbedded with metasedimentary rocks in a small area near the divide between Coal Creek and Metal Creek. Believed to represent aquagene tuff analogous to widespread thicker metavolcanic rocks in Cordova and Valdez quads.			AN002	442	Anchorage	Sed	2705	Kvv

Rock unit	Unit hame	Age	Description	Fossil	Radiometric age	Source code	Class code	Quadrangle	Rock class	NSA class	Label
Mzm	McHugh Complex of the Valdez Group	Mesozoic□□	Strongly deformed, melange-like assemblage of diverse lithologies between Eagle River and Border Ranges faults. Broad zones as wide as 1 km of intense shearing lack any stratal continuity and, in many places, are marked by angular, elongate phacoids, either enclosed in pervasively sheared matrix or juxtaposed against other phacoids. Larger phacoids are lithologically diverse, consisting of schist, amphibolite, marble, sandstone, conglomerate, diorite, gabbro, serpentinized ultramafic rocks, and mafic volcanic rocks.			AN002	443	Anchorage	Melange	2190	Kmk
Kt	Leucotonalite and trondhjemite	Early Cretaceous□□	Medium-grained plugs and elongate irregular-shaped, sill-like bodies of leucocratic plutonic rocks in northern Chugach Mountains in a zone about 5 km wide near Border Ranges fault. Rocks are foliated and contain less than 10% mafic minerals including muscovite, biotite, or hornblende (and minor garnet).		K-Ar on hornblende 126-124 Ma, biotite 116 MA, and muscovite 110 Ma, and a concordant U-Pb age of 103Ma. Ar/Ar ages on hornblende 129,125, and 114 Ma, biotite 123 Ma, and muscovite 118 Ma, and two Rb/Sr isochrons 133 and 130 Ma.	AN002	450	Anchorage	Ign	2570	Ktt
Jtr	Trondhjemite	Late Jurassic□□	Two discordant, NE-trending, elongate, epizonal, muscovite-biotite, leucocratic plutons intruding Jurassic quartz diorite (Jqd) and amphibolite (Jma) in Talkeetna Mountains. Bodies are generally altered and sheared and have a faint foliation locally.		K-Ar age from the northern pluton is 129 Ma and 2 K-Ar ages for hte southern pluton range from 134-142 Ma. Four K-Ar ages from the northern pluton which extends in to the TK quad are tightly clustered from 143 to 149 Ma.	AN002	501	Anchorage	Ign	3380	Jtr
Trl	Limestone and marble	Late Triassic□□	Unfossiliferous, massive to poorly bedded limestone near head of east fork of Kings River, and limestone lenses as much as 30 m thick in broad shear zones in the Talkeetna Formation along the Castle Mountain fault; medium- to coarse-grained marble occurring as roof pendants in epizonal plutons in the Talkeetna Mountains is thought to be correlative.			AN002	600	Anchorage	Sed	4030	JTrlm
Qs	Surficial deposits	Quaternary	Glacial and alluvial deposits, chiefly unconcolidated gravel, sand, and clay			TK002	200	Talkeetna Mountains	Unconsol	100	Qs
Tv	Volcanics	Paleocene to Miocene	Over 1500 m of felsic to mafic subaerial volcanics and related shallow intrusives. Small stocks, irregular dikes, lenticular flows, and thick layers of pyroclastic rocks; predominately consists of fine- to medium-grained, generally medium-gray quartz latite, rhyolite, and latite.		K-Ar (3 samples) from andesite in the middle of the sequence	TK002	321	Talkeetna Mountains	Ign	1000	Tvu

Rock unit	Unit hame	Age	Description	Fossil	Radiometric age	Source code	Class code	Quadrangle	Rock class	NSA class	Label
Tim	Hyabyssal Mafic Intrusives	Paleocene to Miocene	Small stocks and irregular dikes of diorite prophyry, diabase, and basalt. Probably the subvolcanic equivalent of the andesite flows of unit Tv.			TK002	350	Talkeetna Mountains	Ign	1012	Thm
Tif	Hyabyssal Felsic Intrusives	Paleocene to Miocene	Small stocks and irregular dikes of rhyolite, quartz latite, and latite. Probably correlative with the felsic subvolcanic equivalent of unit Tv.			TK002	340	Talkeetna Mountains	Ign	1011	Thf
Ttw	Tsadaka and Wishbone Fm Undivided	Miocene and (Paleocene to Eocene) respectively	The Tsadaka consists of cobble-boulder conglomerate with thin interbeds of sandstone, siltstone, and shale; about 200m thick. The Wishbone Formation unconformably underlies the Tsadaka. It comprises well-indurated fluvitile conglomerate with thick interbeds of sandstone, siltstone, and claystone;about 600 to 900 m thick. Unit also includes over 150 m of fluvatile conglomerate and coaly sandstone.			TK002	331	Talkeetna Mountains	Sed	790	Ttw
Tc	Chickaloon Fm	Paleocene	Well-indurated, continental, dominately fluvatile sequence of massive feldspathic sandstone, siltstone, claystone, and conglomerate, containing numerous beds of bituminous coal; over 1500 m thick			TK002	330	Talkeetna Mountains	Sed	900	Tch
Tsu	Sedimentary, undifferentiated	Tertiary	Fluvatile conglomerate, sandstone, and claystone with a few interbeds of lignitic coal. Looks similar to the sedimentary rocks of the southern Talkeetna Mountains but lacks fossil evidence for definitive correlation. The sequence is over 160 m thick. It resembles the Chickaloon Formation, lithologically.			TK002	371	Talkeetna Mountains	Sed	500	Tsu
Tgd	Granodiorite	Eocene	Contains hornblende and biotite. Part of a small pluton along the northern edge of map area.		K-Ar on biotite 48.8 +/- 1.5 m.y. and on hornblende 44.8 +/- 1.3 m.y.	TK002	370	Talkeetna Mountains	Ign	1300	Tegr
Thgd	Biotite-Hornblende Granodiorite	Paleocene and Eocene	Granodiorite predominates, but locally it grades into adamellite, tonalite, and quartz diorite. All of these rocks are medium to dark gray, medium grained, generally structurless, and have granitic to seriate textures. In all of them hornblende is the chief mafic mineral. Biotite- and hornblende-rich xenoliths are common in every pluton. These epizonal plutons are equivalent to felsics in Tv.		K-Ar age on biotite 58.6 and 54.8	TK002	341	Talkeetna Mountains	Ign	1320	Tpgr
Tbgd	Biotite Granodiorite	Paleocene and Eocene	Biotite granodiorite and adamellite in about equal proportions. These rocks are light to medium gray, medium- to coarse- grained, and have granitic to seriate textures. Biotite is the chief mafic mineral. Faint flow structures evident. Plutons are shallow epizonal occurrances commonly with aplitic and pegmatitic dikes. Considered to be plutonic equivalent of felsic volcanics of Tv.		Considered to be the same age as Thgd. K-Ar ages on biotite range from 56.3 to 58.6.	TK002	311	Talkeetna Mountains	Ign	1320	Tpgr

Rock unit	Unit hame	Age	Description	Fossil	Radiometric age	Source code	Class code	Quadrangle	Rock class	NSA class	Label
Tsmg	Schist, migmitite, and granite	Paleocene	Undifferentiated terrane of andalusite and sillimanite-bearing schist, lit-par-lit type migmatite, and small granitic bodies with moderately to well-developed foliation. Contacts generally gradational between these rocks as it is between the schist and its unmetamorphosed pelitic rock equivalent (Kag). Pelitic schist is medium-grained, has well-developed but wavy foliation. Minerology of the schist includes biotite, quartz, plagioclase, minor K-spar, muscovite, garnet, and sillimanite which coexists with andalusite.		K-Ar age on biotite of 58.7 m.y.	TK002	361	Talkeetna Mountains	Meta	1720	TKgg
Tkt	Tonalite	Late Cretaceous and early Paleocene	Dominately biotite-hornblende tonalite, locally grades into quartz diorite. The tonalite is medium gray, coarse to medium grained, has a granitic texture and a fairly well-developed primary foliation.		K-Ar age ranges on biotite of 61.7 to 72m.y. K-Ar ages on hornblende 61 to 74.4 m.y.	TK002	301	Talkeetna Mountains	Ign	1660	TKm
TKa	Adamellite	Late Cretaceous and early Paleocene	Occurs in large epizonal plutons dominately adamellite but locally includes granodiorite. Biotite is the chief mafic mineral. Medium to coarse grained, medium to light gray, textures ranges from granititic to serate. The age dates indicate that this rock unit is comagmatic with the tonalite.		K-Ar age ranges on biotite of 65 m.y. K-Ar ages on muscovite 67.2 m.y.	TK002	310	Talkeetna Mountains	Ign	1655	TKg
TKgr	Granititic rocks undivided	Cretaceous and (or) Tertiary	Rocks of uncertain age occur in four smaller epizonal plutons of granodiorite and tonalite. Color is medium to dark gray, grain size is medium, texture is granititic. Mafic minerals are hornblende and biotite.			TK002	300	Talkeetna Mountains	Ign	1660	TKm
TKlg	Leucogabbro	Cretaceous and (or) Tertiary	Small poorly exposed intrusive of uncertain age essentially consisting of plagioclase and pale-green hornblende. Medium to light gray, coarse to medium grained, with a granitic to seriate texture.			TK002	320	Talkeetna Mountains	Ign	1670	TKgb
Kar	Arkose Ridge Fm	Cretaceous (Eocene/Paleocene probably)	Arkosic sandstone, conglomerate, graywacke, siltstone, and shale. Clasts consist chiefly of granitic and metamorphic rock frags, quartz, feldspar, and biotite. Plant fragments indicate a terrestial origin. The formation rests unconformably on Jurassic granitic and metamorphic rocks and is as much as 700 m thick.		K-Ar on biotite yields an age of 67.5 m.y.	TK002	511	Talkeetna Mountains	Sed	890	Tar
Km	Matanuska Fm	Cretaceous	Well-indurated shale, siltstone, sandstone, graywacke, with subordinate conglomerate interbeds; total thickness in excess of 1200 m. Generally dark gray and thinly bedded, mostly marine depositional environment of moderate to shallow depths. May correlate to the Kennicott, Shulze, Chititna, and the MacCall Ridge fms of the southern Wrangell Mountains.	Plant frags		TK002	500	Talkeetna Mountains	Sed	2010	Km
Jn	Naknek Fm	Late Jurassic	Shallow marine, thin to thick bedded, intercalated strata of fossiliferous gray siltstone, shale, sandstone, and conglomerate; over 1400 m thick. Correlates with the Root Glacier Fm of the southern Wrangell Mountains.			TK002	421	Talkeetna Mountains	Sed	3010	Jn

Rock unit	Unit hame	Age	Description	Fossil	Radiometric age	Source code	Class code	Quadrangle	Rock class	NSA class	Label
Jct	Chinitna Fm and Tuxedni Group (Middle Jurassic) undivided	Late Jurassic	The Chinitna is shallow marine, intercalated sequence of dark-gray shale, siltstone, and subordinate graywacke; contains numerous large limestone concretions; it is as much as 600 m thick. The Tuxedni Group is shallow marine, well-indurated, thinly to thickly bedded graywacke, sandstone, and massive conglomerate in it lower part. The upper part consists of thinly to thickly bedded dark siltstone and shale; thickness is 300-400 m. This unit is partly correlative with the Nizina Mountain Fm of the southern Wrangell Mountains.			TK002	431	Talkeetna Mountains	Sed	3140	Jtxc
Jtk	Talkeetna Fm	Early Jurassic	Andesitic flows, flow breccia, tuff, and agglomerate; subordinate interbeds of sandstone, siltstone, and limestone. A dominately shallow marine sequence about 1000 to 2000 m thick			TK002	411	Talkeetna Mountains	Ign	3250	JTrtk
Jls	Limestone	Early Jurassic	Light to dark-gray, fine- to medium-grained unfossiliferous limestone; near granitic rocks recrystallized to marble. Forms lenticular bodies, as much as 30 m thick, within the Talkeetna Fm.			TK002	410	Talkeetna Mountains	Sed	4031	JTrlm
Jtr	Trondhjemite	Late Jurassic	Forms discordant, NE trending epizonal pluton. Large portions have been sheared and saussuritized. Light gray, medium to coarse grained with granitic texture. A faint flow foliation is lovally developed. Major minerals include plagioclase, quartz, k-spar, biotite, with some muscovitre and opaques.		K-Ar ages on biotite range from 99.4 to 148.5; on muscovite they range from 129 to 146 m.y. One biotite age of 67.8 m.y. was probably reset by a more recent event	TK002	400	Talkeetna Mountains	Ign	3380	Jtr
Jgd	Granodiorite	Middle to Late Jurassic	Dominately granodiorite but includes minor amounts of tonalite and quartz diorite. Medium to dark gray, medium grained, and in undeEromed rocks have granitic texture. Mafics includes biotite and hornblende. Ne-trending secondary foliation is present in cataclasically deformed rock.		K-Ar ages on biotite range from 144 to 174; on hornblende range from 154 to 167. A zircon age of 125 was also determined using fission track.	TK002	401	Talkeetna Mountains	Ign	3402	Jgd
Jgdm	Migmatite border zone of Granodiorite	Middle to Late Jurassic	Forms a terrane of poorly exposed, intricately intermixed contact schist, amphibole, and small dikes and veinlets of granodiorite.			TK002	470	Talkeetna Mountains	Meta	3621	PPast
Jmrb	Marble	Middle to Late Jurassic metamorphic age	Contact metamorphosed marble bed more than 40 m thick within migmatitic border zone. The rock is white, coarse to medium grained with prophyroblastic cystals of garnet and diopside.			TK002	480	Talkeetna Mountains	Meta	5955	PPaskm
Jqd	Quartz diorite	Middle to Early Jurassic	Dominately quartz diorite but also includes diorite and tonalite. Large portions have been intensively sheared and altered. Fresh rock is medium to dark greenish gray, medium to coarse grained, and has granitic texture. Where altered, the quartz diorite consists of mineral aggregates of epidote, chlorite, and sericite.			TK002	420	Talkeetna Mountains	Ign	3403	Jqd

Rock unit	Unit hame	Age	Description	Fossil	Radiometric age	Source code	Class code	Quadrangle	Rock class	NSA class	Label
Jam	amphibolite	Middle to Early Jurassic metamorphic age	Dominately amphibolite but includes subordinate amounts of greenschist and fgoliated diorite. Amphibolite is generally dark greenish gray, medium to coarse grained, but fine-grained varieties also occur.		K-Ar age on hornblende of 176.6 m.y.	TK002	441	Talkeetna Mountains	Meta	5550	PPast
Jmb	marble	Middle to Early Jurassic metamorphic age	White, medium- to coarse grained, massive interbeds within the amphibolite terrane of Jam. Contains subordinate amounts of garnet and diopside.			TK002	450	Talkeetna Mountains	Meta	5955	PPaskm
Jgs	greenstone	Middle to Early Jurassic metamorphic age	Dark greenish gray, fine-grained, generally structurless rock. Oringinal minerologiy was pyroxene, amphibole, and plagioclase which altered to chlorite, epidote, serpentine, calcite, and minor sericite and quartz.			TK002	461	Talkeetna Mountains	Meta	5641	PPast
Jpmu	Plutonic and metamorphic rocks, undifferentiated	Middle to Early Jurassic metamorphic age	Intermixed mosaic of most of the previously discussed Jurassic metamorphic and plutonic rocks (Jtr, Jgd, Jgdm, Jqd, Jgs, and Jps). Two rock types, amphibolite and sheared quartz diorite, dominate the terrane.			TK002	440	Talkeetna Mountains	Meta	3600	PPast
Trv	Basaltic metavolcanic rocks	Late Triassic	Shallow water marine unit consists of amygdaloidal metabasalt flows with very subordinate amounts of thin interbeds of metachert, argillite, metavolcaniclastic rocks, and marble. Minimum thickness of the unit is 800 m. Metabasaltic flows are as much as 10 m thick and display columnar jointing and pillow structures			TK002	360	Talkeetna Mountains	Meta	4430	Trn
Pzv	Basaltic to andesitic metavolcanic rocks	Pennsylvanian (?) and Early Permian)	Rocks of this unit form an interlayered heterogeneous, dominately marine sequence over 5000 m thick. Primarily consists of metamorphosed flows and tuffs of basaltic and andesitic compositions. Mudstone, bioclastic marble, and dark-gray to black phyllite are subordinate.			TK002	100	Talkeetna Mountains	Meta	5630	PPasc
Pls	Marble	Pennsylvanian (?) and Early Permian ?)	Forms lenticular interbeds, as much as a few tens of meters thick, within basaltic to andesitic late Paleozoic metavolcanogenic sequence (Pzv). Rock is light gray to white, medium to coarse grained, thick-bedded to massive marble.	Poorly preserved and generally unidentified crinoid columnals, brachipods, bryozoans, and rarely corals.		TK002	101	Talkeetna Mountains	Meta	5955	PPaskm
Js	Sedimentary and volcanic rocks, undivided	Late Jurassic	These rocks comprise a section of intercalated argillite and graywacke, pebble conglomerate, and flows and dikes of andesite to latitic feldspar porphyry. The argillite and fine-grained graywacke are thinly to moderately thickly bedded and generally are dark gray. The conglomerates are massive, and the well-rounded to sub-rounded pebbles consist chiefly of unmetamorphosed andesite, latite, and subordinate amounts of dacite. Unit not shown on compilation, lump in KJf.	well-preserved fossils of Buchia rugosa from argillite indicating a Late Jurassic age.		TK002	460	Talkeetna Mountains	Sed	2850	KJf

Rock unit	Unit hame	Age	Description	Fossil	Radiometric age	Source code	Class code	Quadrangle	Rock class	NSA class	Label
Kag	Argillite and lithic graywacke	Early Cretaceous	These rocks occur in a monotous, intensely deformed flyschlike turbidite sequence, probably several thousand meters thick. The rocks are highly indurated, and many are sheared and pervasively cleaved. Most cleavage is axial plane cleavage. The argillite is dark gray to black with detrital mica as much as 1 mm in diameter. Graywacke is dark to medium gray, fine to medium grained, and occurs intercalated with the argillite.	poorly preserved fossils of Incoceramus sp.; a block of Buchia-bearing limestone was found in float.		TK002	510	Talkeetna Mountains	Sed	5210	Mzpca
Trvs	Metabasalt and slate	Late Triassic	Shallow marine, interbedded sequence of amygdaloidal metabasalt flows and slate. Sequence is tightly folded along with Kag and slightly metamorphosed and unv\evenly sheared. The metabasalt is dark greenish gray, aphanitic, with numerous amygdules. The slate is dark gray to black.	Monotis subcircularis and Heterorstridium sp. in argillite beds		TK002	351	Talkeetna Mountains	Meta	4450	Trnm
DSga	Graywacke, argillite, and shale	Silurian ? to Middle Devonian	This unit is poorly known. The component rocks identifed are medium to dark gray, sheared and tightly folded with vertical dips, and occur intercalated in beds as much as 1 m thick.			TK002	600	Talkeetna Mountains	Sed	2192	Kmar
Jta	Crystal tuff, agillite, chert, graywacke and limestone	Jurassic	Shallow to moderately deep marine sequence, tightly folded and interally faulted, at least several thousand meters thick. Tuff is light to dark gray, locally with a greenish tint and weathers to brown. It is massive with obscure rhythmic laminations and thin bedding. Argilllite and chert are gray to black; graywacke is medium to dark gray; and limestone is medium gray.			TK002	451	Talkeetna Mountains	Ign	3850	JTrct
Ksu	Sedimentary rocks, Undivided	Early Cretaceous	Shallow marine sequence of thinly bedded calcareous sandstone, siltstone, claystone, minor conglomerate, and thick-bedded to massive clastic limestone; over 100m thick			TK002	501	Talkeetna Mountains	Sed	2100	Knl
CZum	Ultramafic and mafic rocks	Cambrian and/or Precambrian	Serpentinite and greenstone intruded by gabbro and diorite			LG002	899	Livengood	Ign	8250	CZum
CZwa	Wickersham unit--Maroon and green argillite	Early Cambrian and Late Proterozoic	Maroon and green argillite, phyllite, quartzite, graywacke, siltite, and phyllite. Unit is characterized by the relative lack of grit except in the far western part of the quadrangle			LG002	902	Livengood	Meta	8310	CZwa
CZwa	Wickersham unit--Maroon and green argillite	Early Cambrian and Late Proterozoic	Maroon and green argillite, grit, quartzite, siltite, graywacke and phyllite--As mapped includes thin beds of dark limestone, which are probably equivalent to unit CZwl, as mapped in other areas, but which are areally restricted and are not mapped separately in this area			LG002	902	Livengood	Meta	8310	CZwa
CZw	Wickersham unit--Grit	Early Cambrian and Late Proterozoic	Grit, quartzite, phyllite, and slate. Differs from other grit units in that it contains chert. Includes limestone interbeds (l) that lithologically resemble subunit CZwl Livengood Area			LG002	903	Livengood	Meta	8300	CZw
CZwl	Wickersham unit--limestone	Early Cambrian and Late Proterozoic	Dark-gray arenaceous limestone			LG002	901	Livengood	Sed	8000	CZwl
CZwl	Wickersham unit--Dark limestone	Early Cambrian and Late Proterozoic	Sparsely or non-arenaceous limestone			LG002	901	Livengood	Sed	8000	CZwl
Dc	Cascaden Ridge unit	Middle Devonian	Shale, siltstone, sandstone, conglomerate, and minor limestone			LG002	847	Livengood	Sed	6940	Dcb

Rock unit	Unit hame	Age	Description	Fossil	Radiometric age	Source code	Class code	Quadrangle	Rock class	NSA class	Label
Dq	Quail unit	Late Devonian?	Conglomerate, phyllite, calc-phyllite, siltstone, and sandstone			LG002	844	Livengood	Sed	6920	Dq
DSl	Lost Creek unit	Devonian and Silurian	Limestone and varied sedimentary rocks			LG002	850	Livengood	Sed	6955	Dlc
Dsl	Schwatka unit--Limestone	Middle and Early Devonian	Limestone			LG002	842	Livengood	Sed	6945	Ds
DSt	Tolovana Limestone	Middle Devonian to Early? Silurian	Limestone and rare dolomite			LG002	849	Livengood	Sed	6965	DSt
Dsv	Schwatka unit--Mafic volcanic rocks	Middle and Early Devonian	Mafic volcanic rocks and minor clastic sedimentary rocks			LG002	841	Livengood	Ign	7010	Dsv
Ka	Alaskite	Late Cretaceous	Exposed at Raven Creek Hill			LG002	410	Livengood	Ign	2450	Kg
Kd	Dikes	Cretaceous?	Bodies ranging in composition from granite to diorite			LG002	400	Livengood	Ign	2400	Kg
Kg	Granite	Late Cretaceous	Pedro Dome and rocks in its vicinity			LG002	430	Livengood	Ign	2475	Kg
Kgd	Granodiorite	Late Cretaceous	Pedro Dome and rocks in its vicinity			LG002	435	Livengood	Ign	2480	Kg
KJv	Vrain unit	Early Cretaceous and/or Jurassic	Pyritiferous shale and minor siltstone. Not flysch, thought by Tom Dutro to be equivalent to upper part of Glenn Shale.			LG002	495	Livengood	Sed	2860	KJvr
KJw	Wolverine unit	Early Cretaceous and/or Jurassic	Quartzite and interbedded shale and siltstone			LG002	491	Livengood	Sed	2815	KJw
Km	Minto unit	Late Cretaceous?	Siltstone, mudstone, graywacke, quartzose sandstone, and plant-fragment-bearing siltstone			LG002	405	Livengood	Sed	1980	Kms
Kmo	Quartz monzonite, monzonite, and syenite	Late Cretaceous	Comprises Sawtooth, Wolverine, Elephant Mountains, and Huron Creek plutons			LG002	401	Livengood	Ign	2470	Kg
Ks	Syenite	Late Cretaceous	Roy Creek stock			LG002	420	Livengood	Ign	2465	Kg
Kwcc	Wilber Creek flysch unit, coarse-grained	Early Cretaceous; Albian	Polymictic conglomerate, conglomeratic graywacke, and shale			LG002	480	Livengood	Sed	2115	Kwcf
Kwcs	Wilber Creek flysch unit, fine-grained	Early Cretaceous; Albian	Shale, siltstone, and graywacke			LG002	480	Livengood	Sed	2115	Kwcf
MzPzp	Phyllite, amphibolite, greenstone, and diorite	Mesozoic or Paleozoic	Phyllite, amphibolite, greenstone, and diorite			LG002	795	Livengood	Meta	5216	KJvr?
MzPzr	Raven Creek Hill unit	Mesozoic or Paleozoic	Metasedimentary gneiss, mica schist, phyllite, and hornfels			LG002	791	Livengood	Meta	5208	TPza
Ofs	Fossil Creek Volcanics--Shale	Ordovician	Shale, chert, and limestone intruded by gabbro			LG002	860	Livengood	Sed	7610	Ofc
Ofv	Fossil Creek Volcanics--Alkali basalt	Ordovician	Alkali basalt, agglomerate, and volcanoclastic conglomerate.			LG002	860	Livengood	Ign	7610	Ofc
Old	Livengood Dome Chert	Late Ordovician	Chert, siliceous slate with rare greenstone and limestone			LG002	871	Livengood	Meta	7710	Och
PDms	Metamorphic and sedimentary rocks	Permian to Devonian?	Black and greenish-gray siliceous slate, chert, siltstone, debris flows, and greenstone			LG002	801	Livengood	Meta	5615	PDms
PMs	Greenish-gray siliceous slate, quartzite, chert, and greenstone	Permian to Mississippian				LG002	805	Livengood	Meta	5600	PDms
Ps	Sedimentary rocks	Permian	Argillite, siltstone, sandstone, and minor conglomerate			LG002	750	Livengood	Sed	5740	Ps
Pzc	Chatanika unit	Paleozoic	Allochthonous, garnet-bearing quartz-biotite-muscovite schist, and quartzite. Primarily epidote-amphibolite facies rocks, but also includes eclogitic rocks			LG002	890	Livengood	Meta	5510	Pze
PzZm	Mafic igneous rocks	Paleozoic and/or Late Proterozoic	Includes minor interlayered sedimentary rocks			LG002	912	Livengood	Ign	8450	MzZum
Qa	Alluvium	Holocene				LG002	105	Livengood	Unconsol	100	Qs
Qab	Abandoned or inactive flood plain deposits	Holocene	Includes natural levees on streams in the Minto Flats			LG002	111	Livengood	Unconsol	100	Qs
Qaf	Alluvial fan deposits	Holocene				LG002	100	Livengood	Unconsol	100	Qs
Qd	Sand dune deposits	Holocene				LG002	120	Livengood	Unconsol	100	Qs
Qg	Reworked creek gravels in placer mining areas	Holocene				LG002	100	Livengood	Unconsol	100	Qpm

Rock unit	Unit hame	Age	Description	Fossil	Radiometric age	Source code	Class code	Quadrangle	Rock class	NSA class	Label
Qlc	Loess and colluvium	Holocene	Includes minor upland alluvium			LG002	100	Livengood	Unconsol	100	Qs
Qs	Swamp deposits	Holocene				LG002	113	Livengood	Unconsol	100	Qs
Qsu	Reworked silt, undifferentiated, and organic deposits	Holocene	Includes swamp deposits			LG002	113	Livengood	Unconsol	100	Qs
QTg	Gravel, sand, and silt	Holocene to Pliocene	Poorly consolidated deposits			LG002	285	Livengood	Sed	100	Qs
SZa	Amy Creek unit	Silurian? to Late Proterozoic	Siliceous dolomite, chert, and basaltic greenstone, minor limestone, shale and siltstone			LG002	911	Livengood	Sed	6680	SZa
Tb	Olivine basalt	Tertiary				LG002	230	Livengood	Ign	1004	Tb
Tgp	Peraluminous granite	Paleocene	Cache Mountain pluton			LG002	240	Livengood	Ign	1320	Tpgr
TKg	Felsic granitic rocks	Tertiary and/or Cretaceous	Small intrusive bodies in the upper Wilber Creek area			LG002	291	Livengood	Ign	1655	TKg
TKg	Felsic granitic rocks	Tertiary and/or Cretaceous	Vault pluton			LG002	291	Livengood	Ign	1655	TKg
TKm	Monzonite	Tertiary and/or Cretaceous	Cascaden Ridge pluton			LG002	295	Livengood	Ign	1660	TKm
Tm	Monzonite(?) or Monzodiorite(?	Paleocene?	Northeast of Tolovana Hot Springs pluton			LG002	255	Livengood	Ign	1350	Thgd
Tqm	Quartz monzonite	Paleocene	Tolovana Hot Springs pluton			LG002	251	Livengood	Ign	1320	Tpgr
Trc	Black shale and chert	Triassic				LG002	601	Livengood	Sed	4110	Trcs
Trm	Mafic igneous rocks	Triassic?	Gabbro and diabase sills and dikes.			LG002	610	Livengood	Ign	4210	Trn
TrMrs	Rampart Group--Sedimentary rocks	Triassic to Mississippian	Argillite, chert, graywacke, shale, and limestone			LG002	692	Livengood	Sed	5020	TrMts
TrMrv	Rampart Group--Igneous rocks	Triassic to Mississippian	Intrusive and extrusive mafic igneous rocks, and a few intermixed sedimentary rocks			LG002	691	Livengood	Ign	5130	JTrtmu
Trs	Calcareous phosphatic shale and limestone	Triassic	Includes minor calcareous sandstone and granule conglomerate			LG002	605	Livengood	Sed	4080	Trgl
Tvs	Volcanic and sedimentary rocks, undivided	Oligocene and Eocene	Conglomerate, sandstone, shale, and basalt			LG002	209	Livengood	Sed	795	Tvs
Zf	Fairbanks schist unit--undivided	Late Proterozoic	Greenschist facies muscovite-chlorite schist, quartzite, and phyllite. Locally, divided into:			LG002	930	Livengood	Meta	9320	PzZyqs
Zfc	Fairbanks schist unit--Cleary subunit	Late Proterozoic	Facies characterized by white felsic schist, micaceous quartzite, chloritic or actinolitic greenschist, greenstone, and marble			LG002	940	Livengood	Meta	9321	PzZyqs
Zwg	Grit	Late Proterozoic	Bimodal quartzite, gray and olive-gray greenschist-facies argillite. Unit age is considered to be Hadrynian			LG002	925	Livengood	Meta	8410	Zwg
Qa	Alluvium	Quaternary	Gravel, sand, silt; gray or buff, uncolsolidated, well-stratified; mapped only in valleys of major streams. Includes gravel, sand, and silt of low terraces			BD002	100	Big Delta	Unconsol	100	Qs
Qac	Alluvium and colluvium	Quaternary	Boulders, gravel, sand, silt, and angular rock fragments. In large river valleys contains much perennially frozen organic silt and peat.			BD002	101	Big Delta	Unconsol	100	Qs
Ql	Loess	Quaternary	Silt, eolian; light brown to brownish gray, unconsolidated, well-sorted, massive to poorly stratified; locally mottled by iron stains. In places contains venefacts. Thickness ranges from 1 to 50 m.			BD002	110	Big Delta	Unconsol	100	Qs
Qs	Sand	Quaternary	Sand, eolian; yellowish brown to grayish orange, light gray and olive gray, unconsolidated, forms dunes as much as 21 m high and dune fields 1 or more square kilometers in area. Sand is commonly overlain by as much as 1 m of loess.			BD002	111	Big Delta	Unconsol	100	Qs

Rock unit	Unit hame	Age	Description	Fossil	Radiometric age	Source code	Class code	Quadrangle	Rock class	NSA class	Label
Qsp	Silt and peat	Quaternary	Organic silt deposited in swamps, black or mottled gray and brown. Mostly perennially frozen. Only the large areas of this unit in the vicinity of the Tanana valley are mapped			BD002	120	Big Delta	Unconsol	100	Qs
Qab	Abandoned floodplain alluvium	Quaternary	Unconsolidated silt, sand, pebbles, and cobbles, in well-stratified layers and lenses. Light to dark gray and buff to brown; includes much organic material and grades into swamp deposits in poorly drained ares.			BD002	121	Big Delta	Unconsol	100	Qs
Qf	Fan deposits	Quaternary	Sand, gravel, and cobbles, in fairly well-stratified layers and lenses. Primarily distal segments of undifferientiated glacial outwash fans, mantled with loess.			BD002	130	Big Delta	Unconsol	100	Qs
Qm	Moraine deposits	Quaternary	Boulders, gravel, sand, and silty sand, in terminal moraine, lateral moraine, moraine in cirques, and ground moraine of several different ice advances.			BD002	131	Big Delta	Unconsol	100	Qs
Qdo	Outwash of Donnelly glaciation	Quaternary	Gravel and sandy gravel, light yellowish-brown to gray, moderately to well-rounded, in unconsolidated well-stratified layers and lenses			BD002	140	Big Delta	Unconsol	100	Qs
Qdlm	Morainal deposits of Delta glaciation	Quaternary	Till, sandy, yellowish-gray to light reddish-brown, unconsolidated, unstratified. Gravel is angular to well-rounded, 2 cm to 24 cm in diameter			BD002	141	Big Delta	Unconsol	100	Qs
Qdlo	Outwash of Delta glaciation	Quaternary	Gravel silty or sandy, with lenses of well-sorted sand; light yellowish -brown. Gravel well-rounded, poorly to moderately well-sorted in unconsolidated moderately well-stratified layers			BD002	150	Big Delta	Unconsol	100	Qs
Tn	Nenana gravel	Tertiary	Conglomerate and minor amounts of sandstone; yellowish-gray to reddish-brown, poorly consolidated, well-sorted. Conglomerate particles, mostly well-rounded, up to 8 cm in diameter, characteristically iron-stained.			BD002	200	Big Delta	Sed	570	Tn
Tcb	Coal-bearing formation	Tertiary	Sandstone, siltstone, claystone, and conglomerate, light-yellowish-gray to light-reddish-brown, poorly consolidated, easily eroded. Conglomerate particles mostly well-rounded quartz and chert as much as 4 cm in diameter. Lignitic coal layers as much as 30 cm thick are rare. Limonitic sandstone concretions common.			BD002	201	Big Delta	Sed	640	Tcb
Tcs	Conglomerate, Sandstone, Siltstone, Shale	Tertiary	Light gray, poorly consolidated, poorly bedded. Conglomerate clasts are well-rounded to fairly angular and extremely variable in size ranging from granules to 1 m boulders of several types of granitic rock, gneiss, white quartz, and rarely schist. Sandstone is coarse- to fine-grained, olive-gray, brown, or orange-brown. Siltstone is olive-gray.			BD002	210	Big Delta	Sed	500	Tsu
Tg	Granitic rocks	Tertiary	Quartz monzonite to granite; medium to coarse grained; equigranular to porphyritic; massive without linear or planar fabric or microfabric; commonly weathered and crumbly. Only plutons with Tertiary K-Ar dates are included in this unit. Plutons that may be Tertiary but are undated are included in TKg.			BD002	211	Big Delta	Ign	1320	Tpgr

Rock unit	Unit hame	Age	Description	Fossil	Radiometric age	Source code	Class code	Quadrangle	Rock class	NSA class	Label
Tf	Felsic igneous rocks	Tertiary	Lava, shallow, intrusives and dikes and sills. Lava in eastern part of quad, gray with smokey quartz, sanidine, plagioclase, biotite, and hornblende phenocrysts. Phenocrysts may be as long as 2 - 5 mm. Some are 10 mm long. Rock generally fractured and crumbly. Locally glass matrix; glass has perlitic dehydration cracks.			BD002	220	Big Delta	Ign	1011	Thf
TKg	Granodiorite to Quartz Monzonite	Tertiary and Cretaceous	Medium grained; equigranular to porphyritic; massive without linear or planar fabric. The rocks contain biotite, hornblende, muscovite, with biotite the most common mafic mineral. The rocks in this unit are not radiometrically dated			BD002	221	Big Delta	Ign	1655	TKg
Kg	Granodiorite to Quartz Monzonite	Cretaceous	Medium to coarse grained; mostly equigranular; massive without linear or planar fabric. The rocks contain biotite is the most common mafic mineral; hornblende is less common.		K-Ar ages are Cretaceous	BD002	300	Big Delta	Ign	2480	Kg
Kd	Diorite and Gabbro	Cretaceous	Diorite medium gray, medium grained; dominately pyroxene, biotite and plagioclase; amphibole may be absent; in places quartz diorite; locally may be gabbro; generally massive. Unit also includes undated dike and lenslike mass of dark-greenish gray, medium- to coarse-grained gabbro ; consists of green hornblende with minor biotite, pyroxene, and plagioclase.			BD002	301	Big Delta	Ign	2440	Kmum
Kp	Quartz-Orthoclase Porphyry	Cretaceous	Pink to tan weathering. Quartz and Carlsbad-twinned orthoclase occur as large as 1 cm; euhedral phenocrysts in aphanitic to fine-grained groundmass; sericitzed.		K-Ar on potassium feldspar	BD002	310	Big Delta	Ign	2450	Kg
Pgc	Greenstone and Chert	Permian	Greenstone is light to dark green or greenish gray, greenish red, or greenish black; fine to coarse grained; mostly massive with weakly developed foliation in places. Chert is green, light, and dark gray, red, and mottled green and gray; massive, closely fractured, and commonly sugary texture.	Radiolarians and conodonts in red chert		BD002	400	Big Delta	Sed	5830	JPzsgs
Pu	Periodotite, partly serpentinized	Paleozoic	Dark green to black; weathers a reddish orange brown; massive. Diabase and diorite inclusions, commonly meters in diameter. A zone of quartz and magnesite, with some dolomite, 1 to 50 m thick. The silica-carbonate rock is bright orange, orange brown, or cream with local green stains.			BD002	401	Big Delta	Ign	5980	JPsu
Pq	Quartzite with some Phyllite, Micaceous Quartzite, Marble, and Calc. Qtz. Schist	Permian	Quartzite and lesser phyllite, micaceous quartzite, marble, and calcareous quartz schist. Quartzite is tan, red, maroon to purple, and black and commonly finely banded. Mostly fine-grained and in places closely folded. Locally has abundant, fine, disseminated sulfides. Age unknown but considered Permian because of association with unit Pgc.			BD002	410	Big Delta	Meta	5960	JPzsgs

Rock unit	Unit hame	Age	Description	Fossil	Radiometric age	Source code	Class code	Quadrangle	Rock class	NSA class	Label
Pzc	Cataclastic rocks	Paleozoic	Mostly mylonite schist and mylonite gneiss; gray, light green and tan; fine to coarse grained; dense and hard to soft and crumbly; fluxion structure common; neomineralization and crystalization evident. Rocks mostly quartzitic and feldspathic with minor amounts of mica, amphiboles, and epidote group minerals. Augen gneiss with perthitic microcline augen common.			BD002	411	Big Delta	Meta	5605	MDtm
Pzsg	Semischist, greenschist, quartzite, phyllite, marble, and greenstone	Paleozoic	Semischist or sheared grit; greenish gray or gray and fine to coarse grained; very quartzitic to very feldspathic; clear, gray, or bluish-gray quartz graine 1 to 5 mm in diameter characteristic; interlayered with quartz-chlorite mica schist and others combinations of greenschist rocks, tan quartzite, gray and tan phyllite, marble, and greenstone. Possibly equivalent to the Totatlinika Schist in the northern Alaska Range.			BD002	420	Big Delta	Meta	6510	MDt
Pzq	Quartzite, Meta-Argillite, Phyllite, Slate, and Marble	Paleozoic	Quartzite commonly black but varies widely in color. Locally, color changes due to contact metamorphism. Interlayered with black or dark-gray meta-argillite. Phyllite, marble, and quartzite more commonly occur in the upper part of the formation but may be absent due to faulting or unconformity.			BD002	421	Big Delta	Meta	5660	Pzk
Pzm	Calcareous Phyllite, Marble and Phyllite	Paleozoic	Light to medium gray, fine to medium grained, thin layered and well foliated, commonly crumbly. Characteristically cut by abundant carbonate-quartz veins and veinlets; locally forms low tors. Age unknown, but stratigraphic relationships suggest early Paleozoic protoliths			BD002	430	Big Delta	Meta	5662	Pzkcp
Pzs	Schist	Paleozoic	Quartz-mica schist with marble and quartzite, calcareous diopside schist, quartz-feldspar rock; and amphibole. Sillimanite is locally abundant near the Salcha River and staurolite, andalusite and kyanite also occur.			BD002	431	Big Delta	Meta	8630	PzZysa
Pzg	Gneiss	Paleozoic	Gray and weathers tan; locally orange brown where altered; mostly medium grained equigranular; respresentative mineralogy is strained quartz, plagioclase, potassium feldspar, red-brown biotite and sillimanite; garnet, tourmaline, zircon, and apatite are common accessory minerals. Age unknown.			BD002	440	Big Delta	Meta	5670	PzZyg
Pzu	Ultramafic rocks	Paleozoic	Light green, greenish gray, or black and less commonly tan, brown, or yellow green; Occurs as small foliated masses infolded with amphibolite facies gneiss and schist. Original rock was peridotite which has been regionally metamorphosed to amphibole, chlorite, and magnetite. Age unknown			BD002	441	Big Delta	Meta	5690	MzZum
Pzd	Diorite	Paleozoic	Medium gray to medium dark gray, fine to medium grained; dark-green to pale-brown hornblende, red-brown biotite abundant in some localities; foliation well-developed locally.			BD002	450	Big Delta	Ign	5440	MzPzi

Rock unit	Unit hame	Age	Description	Fossil	Radiometric age	Source code	Class code	Quadrangle	Rock class	NSA class	Label
PzpCsq	Schist and Quartzite	Paleozoic or Precambrian	Quartz-muscovite-biotite schist, quartz-muscovite schist, quartzite, and amphibole schist; locally garnetiferous. Upper greenschist to lower amphibolite facies. Age unknown. Unit subdivided on published OFR98-133 into PzZysa and PzZysq.			BD002	451	Big Delta	Meta	9327	PzZyqs
PzpCs	Quartzite and Schist	Paleozoic or Precambrian	Quartzite, feldspathic quartzite and quartz-mica schist, medium light gray to medium gray. Quartzite, some shows original bedding, dominates the section. Quartz-biotie schist is commonly; most of the unit is garnetiferous; Upper greenschist to lower amphibolite facies. Age unknown			BD002	460	Big Delta	Meta	9327	PzZyqs
PzpCa	Augen Gneiss	Paleozoic or Precambrian	Augen most commonly of white potassium feldspar, range in size from 1 to 10 cm long, most about 4 cm long. Biotite is scarce to abundant. Foliation layers containing biotite bend around augen. Age unknown.			BD002	461	Big Delta	Meta	6521	MDyao
PzpCg	Gneiss and Quartzite	Paleozoic or Precambrian	Coarse to fine grained gneiss and quartzite; well foliated and banded to massive without banding; locally cataclastic; ranges from peltic with abundant sillimanite to gneisses of probable igneous origin. All rocks are well foliated, and dominant foliation is folded. Protoliths may inclide both Paleozoic and preCambrian sedimentary and igneous rocks.			BD002	470	Big Delta	Meta	8802	PzZypg
Qa	Flood-plain alluvium	Quaternary	Well-stratified layers and lenses of unconsolidated gray silt, sand, pebbles, cobbles, and boulders; occurs in two facies 1) gravelly facies 2) silt and sand facies. Both occur on the Tanana River east of the mouth of the Chena and on other streams in the Alaska Range .			FB002	100	Fairbanks	Unconsol	100	Qs
Qs	Swamp deposits	Quaternary	Dark-brown to black peat and silt more than 5 feet thick in some areas. Perenially frozen and contain lenses and veinlets of clear ice.			FB002	101	Fairbanks	Unconsol	100	Qs
Ql	Landslide debris	Quaternary	Chaotic masses of angular fragments of shale, sandstone, and conglomerate, clay, sand, gravel, and schist embedded in a matrix of silt, clay, and gravel.			FB002	102	Fairbanks	Unconsol	100	Qs
Qg	Reworked creek gravel	Quaternary	Placer-mine dredge tailings derived from buried creek gravels.			FB002	103	Fairbanks	Unconsol	100	Qs
Qbc	Basaltic cinders	Quaternary	Cinder cone from late Pleistocene or Recent eruption at north base of mountain southwest of Buzzard Creek. Unconsolidated poorly sorted aggregate of irregular to subrounded fragments of scoriaceous to dense basalt.			FB002	104	Fairbanks	Unconsol	320	Qcs
Qab	Abandoned flood-plain alluvium	Quaternary	Well-stratifed layers and lenses of unconsolidated gray silt, sand, pebbles, cobbles, and boulders. Occurs in two facies: 1) coarse gravelly alluvium and 2) silty alluvium containing 95% silt and 5% sand.			FB002	105	Fairbanks	Unconsol	100	Qs
Qaf	Alluvial fan deposits	Quaternary	Well-stratified layers and lenses of gray to brown coarse and and pebble, cobble, and boulder gravel.			FB002	106	Fairbanks	Unconsol	100	Qs

Rock unit	Unit hame	Age	Description	Fossil	Radiometric age	Source code	Class code	Quadrangle	Rock class	NSA class	Label
Qdr	Dune Sand, reworked	Quaternary	Organic silty sand underlying undrained depressions and old lake or pond beds; derived from near by sand dunes. Permafrost and considerable ground ice probably present at shallow depths.			FB002	107	Fairbanks	Unconsol	100	Qs
Qrm	Morainal deposits of Riley Creek Glaciation	Quaternary	Unsorted and unstratified glacial till with silt cover 1/2 foot thick. Silt, sand, and gravel containing boulders more than 3 feet in diameter. Coarse fragments angular to rounded. Permafrost present, ice content low to moderate.			FB002	108	Fairbanks	Unconsol	100	Qs
Qro	Outwash of Riley Creek Glaciation	Quaternary	Well-stratified well-sorted porous and very permeable gray to pale yellowish brown sandy gravel containing lenses of coarse well-sorted sand.			FB002	109	Fairbanks	Unconsol	100	Qs
Qtf	Torrential fan deposits	Quaternary	Interfingering cobble and pebble gravel, mudflow deposits, and minor amounts of silt and sand, bordering the foothills. Average coarseness decreases away from foothills.			FB002	110	Fairbanks	Unconsol	100	Qs
Qf	Fairbanks loess	Quaternary	Massive, homogeneous eolian silt on upper slopes and hilltops. Well sorted, less than 10 % clay; grains angular, consist mostly of quartz, feldspar, and mica. Locally cemented by iron oxide, locally calcareous. Thickness ranges form 3 to 200 feet. Color buff to tannish-gray when dry, brown when wet. Locally mottled by iron staining and carbonaceous material.			FB002	111	Fairbanks	Unconsol	100	Qs
Qsu	Perennially frozen silt, undifferentiated	Quaternary	Massive, homogeneous unconsolidated, well-sorted silt of eolian origin containg less than 10% clay, locally rich in organic silt and larger organic fragments. Inorganic components are angular grains of quartz, feldspar, and mica, locally cemented by iron oxides. It is buff to brown or gray, locally mottled. Organic silt is brown to grayish black	Large quantites of plant and animal remains		FB002	112	Fairbanks	Unconsol	100	Qs
Qd	Dune sand	Quaternary	Well-sorted angular to round, moderate yellowish-brown eolian sand consisting of yellowish-white, clear to opaque quartz grains (65 to 85%) but including some dark-gray to black rock fragments.			FB002	113	Fairbanks	Unconsol	100	Qs
Qhm	Morainal deposits of Healy Glaciation	Quaternary	Unstratified glacial till with silt cover 1/2 foot to 3 feet thick. Silt, sand, and gravel with boulders more than 3 feet in diameter. Coarse fragments angular to rounded.			FB002	114	Fairbanks	Unconsol	100	Qs
Qho	Outwash of the Healy Glaciation	Quaternary	Coarse, clean, well-sorted, well-stratified gray to yellowish-brown porous and very permeable gravel with layers and lenses of coarse clean sand.			FB002	115	Fairbanks	Unconsol	100	Qs
Qha	Alluvial fan deposits contemporaneous with Healy Glaciation	Quaternary	On the Dry Creek fan these deposits consist of well-stratified gray to brown pebble, cobble, and boulder gravel with layers and lenses of coarse sand, and range from fine clean gravel with pebbles 1/2 inch to 3 inches in diameter at the north end of fan east of Blair Lakes to gravel with cobbles 8 to 12 inches in diameter south of Blair Lakes. Boulders, cobbles, and pebbles composed of gray granitic rocks, conglomerate, schist, gneiss, diorite, and quartz.			FB002	116	Fairbanks	Unconsol	100	Qs

Rock unit	Unit hame	Age	Description	Fossil	Radiometric age	Source code	Class code	Quadrangle	Rock class	NSA class	Label
Qdm	Morainal deposits of Dry Creek Glaciation	Quaternary	Mapped from aerial photos based on topographic expression. Probably similar to morainal deposits of Healy Glaciation but somewhat more weathered and eroded.			FB002	117	Fairbanks	Unconsol	100	Qs
Qdo	Outwash of Dry Creek Glaciation	Quaternary	Similar to outwash of Healy Glaciation on same stream but more weathered and eroded, and overlain by thicker deposit of windblown silt.			FB002	118	Fairbanks	Unconsol	100	Qs
Qda	Alluvial fan deposits contemporaneous with Dry Creek Glaciation	Quaternary	Similar to alluvial fan deposits of Healy Glaciation on same stream but more weathered and eroded, and overlain by thicker deposit of windblown silt.			FB002	119	Fairbanks	Unconsol	100	Qs
Qbm	Morainal deposists of Browne Glaciation	Quaternary	Coarse sand and gravel, with abundant blocks of granite, gabbro, and conglomerate several feet on a side. Small areas at an altitude of 2200 feet west of Windy Creek and 5000 feet southeast of Gold King Creek consist largely of boulders and blocks. Includes erratics (Qbe) - isolated angular blocks and groups of blocks of granite, gabbro, and conglomerate, 3-30 feet in diameter, resting on present topography .			FB002	120	Fairbanks	Unconsol	100	Qs
Tn	Nenana Gravel	Tertiary	Buff to reddish-brown poorly consolidated pebble to boulder conglomerate and coarse sandstone, with interbedded mudflow deposits, thin claystone layers and local thin lignite beds. Maximum thickness is 2000 feet.			FB002	200	Fairbanks	Sed	570	Tn
Tcb	Coal-bearing formation	Tertiary, Miocene? to Eocene?	Poorly consolidated, readily eroded pebbly sandstone, claystone, and subituminous coal, in synclinal basins in the foothills of the Alaska Range between Nenana River and Dry Creek. Pinches out northward and is overlapped unconformably by Nenana Gravel. Is subdivided into 5 units, see unit description on Map I-455.			FB002	210	Fairbanks	Sed	640	Tcb
Mt	Totatlanika Schist	Mississippian	Predominately quartz-microcline-sericite schist and augen gneiss, gray in color, consisting of a coarse facies having large deformed phenocrysts of microcline, quartz and rare albite 0.1-1 inch in diameter; interbedded with a fine facies consisting of angular grains of feldspar and quartz 0.01-1 inch in diameter, in a dark-gray to yellowish-gray schistose groundmass of sericite and chlorite. Part of unit coded NSACLASS = 5666	Syringopora		FB002	300	Fairbanks	Meta	6510	MDt
DSt	Tolovana (?) Limestone	Middle Silurian to Middle or early Late Devonian	Thick-bedded to massive, fine-crystalline to lithographic, medium dark bluish-gray limestone of unknown thickness. Weathers buff to yellowish-brown. Chert rare or absent. Correlated on basis of lithology and geographic trend.			FB002	400	Fairbanks	Sed	6965	DSt
nc	Nilkoka Group- Chert and siliceous shale	Uncertain but believe to be Precambrian or early Paleozoic	Chert is hard, thin bedded to blocky, locally cut by shear planes, medium light gray or rarely nearly white or black with thin color layering; commonly stained yellow or red by iron oxide from weathering; forms reddish soil. Interbedded siliceous shale is hard, thin bedded, medium light gray weathering to light yellowish gray.	correlated to Mertie's (1937) unit B on basis of fossils (Cambrian or Ordovican)		FB002	500	Fairbanks	Sed	7710	Och

Rock unit	Unit hame	Age	Description	Fossil	Radiometric age	Source code	Class code	Quadrangle	Rock class	NSA class	Label
ng	Nilkoka Group- Grit, argillite, quartzite, and limestone	Uncertain but believe to be Precambrian or early Paleozoic	Interbedded grit and varigated clay slate, quartzite, and phyllite, with rare siltstone beds and a few fine-grained lenticular limestone beds as much as 5 feet thick. Color of fine-grained rocks predominately green but mottled by red through pale olive green, dusky yellow, and light yellowish gray areas produced by leaching and oxidation along joints, on exposed surfaces and in more porous parts. Fine-grained rocks range from argillite to phyllite. Correlated to Mertie's (1937) unit C (pre-Ordovican) and part of his unit D (Late Precambrian).			FB002	501	Fairbanks	Meta	8310	CZwa
bc	Birch Creek Schist	Uncertain but believe to be early Paleozoic or Precambrian	Light- to dark-gray, reddish-brown to tan-weathering schists, predominately quartz-sericite schist and micaeous quartzite. Includes mu-bio schist, garnet-mica schist, calcite-and dolomite-bearing schist, chloritic and graphitic schist, amphibolite, impure marble, and gneiss. Southern most part assigned to NSACLASS = 9322, part out in flats assigned to NSACLASS = 6511		120 m.y. to 1,170 m.y.	FB002	600	Fairbanks	Meta	9327	PzZyqs
Mzi	Intrusive rocks	Probably Mesozoic but may be early Tertiary	Dikes and stocks of granite, granodiorite, dacite, and granite porhyry, intruded into schist formations of the Yukon-Tanana uplands and the Alaska Range. Unconformably overlain by the coal-bearing formation (unit Tcb).			FB002	700	Fairbanks	Ign	1655	TKg
Dmu	Mafic and Ultramafic rocks	Devonian (?)	Ophitic diorite and serpentinized periodotite make up the Wood River Buttes. Ore minerals constitute about 5% of the diorite. Wood RIver Buttes are on a projection with mafic and ultramafic rocks in the Big Delta quad. There is an intense linear positive aeromagnetic anomaly across the alluviated plain between them indicating that they may be a single belt.			FB002	800	Fairbanks	Ign	5980	JPsu
Tb	Basalt		Dark-gray and black or brownish oline basalt, closely jointed and deeply weathered with local pillow or columnar structure; on lower slope of hills near Fort Wainwright.			FB002	900	Fairbanks	Ign	1004	Tb
Qt4	Till, Cirque glaciation	Quaternary?	Unsorted boulder to clay-size particles. Moraine forms locally present, restricted to cirques			TN002	130	Tanana	Unconsol	100	Qs
Qt3	Till	Quaternary	Unsorted boulder to clay-size particles, includes long low lateral moraine on Halu Creek			TN002	136	Tanana	Unconsol	100	Qs
Qt2	Till	Quaternary	Unsorted boulder to clay-size particles, lowest moraine on Halu Creek			TN002	137	Tanana	Unconsol	100	Qs
Qt1	Till	Quaternary?	Unsorted boulder to clay-size particles, farthest down valley moraine on lower Halu Creek.			TN002	138	Tanana	Unconsol	100	Qs
Qt	Till, undifferentiated	Quaternary	Unsorted boulder to clay-size particles, no clear morainic forms.			TN002	135	Tanana	Unconsol	100	Qs
Qal	Recent alluvium	Holocene	Sandy gravel and sandy silt, forms flood plain of modern rivers and streams.			TN002	105	Tanana	Unconsol	100	Qs
Qaf	Alluvial fan deposits	Quaternary	Gravel, silt, and sand, commonly occur at mouth of small side canyons. Includes some colluvial deposits.			TN002	106	Tanana	Unconsol	100	Qs
Qbg	Low-level bench gravel of Minook Creek	Quaternary	Gravel and sand on bench along lower parts of Minook and Hunter Creeks			TN002	109	Tanana	Unconsol	100	Qs

Rock unit	Unit hame	Age	Description	Fossil	Radiometric age	Source code	Class code	Quadrangle	Rock class	NSA class	Label
Qtr	Terrace deposits	Quaternary	Gravel, silt, and sand near mouth of Fleshlanana Creek			TN002	110	Tanana	Unconsol	100	Qs
Qags	Older alluvium	Quaternary	Coarse, silty sand and fine gravel; generally forms terrace sloping up and away from floodplains of streams and rivers			TN002	111	Tanana	Unconsol	100	Qs
QTg	High-level gravel	late Tertiary or early Quaternary	Well packed gravel, caps hills in vicinity of Rampart			TN002	285	Tanana	Unconsol	100	Qs
Qcal	Colluvium and alluvium, undifferentiated	Quaternary	Silt and sand mantling broad, flat valleys			TN002	100	Tanana	Unconsol	100	Qs
Qrs	Recent slide and slump deposits	Holocene	Very fresh, unmodified slumps and earthflows (Occurred about 1940).			TN002	158	Tanana	Unconsol	100	Qs
Qls	Older landslide deposits	Quaternary	Slumps and earth and rock slides			TN002	108	Tanana	Unconsol	100	Qs
Qc	Colluvium, undifferentiated	Quaternary	Predominantly silt, with some sand and gravel.			TN002	107	Tanana	Unconsol	100	Qs
Qta	Talus	Quaternary	Angular boulder rubble in cirque.			TN002	159	Tanana	Unconsol	100	Qs
Ql	Loess	Quaternary	Well-sorted silt			TN002	121	Tanana	Unconsol	100	Qs
Qess	Sand and silt	Quaternary	Well-sorted sand, commonly in subdued dune forms			TN002	120	Tanana	Unconsol	100	Qs
Qb	Rock-defended terraces on Minook Creek	Quaternary	Erosional benches along east side Minook Creek			TN002	160	Tanana	Unknown	100	Qs
Qat	Altiplanation terrace	Quaternary	Flat, even surface, formed on bedrock hilltops generally above 600 m			TN002	161	Tanana	Unknown	100	Qs
QTa	Andesitic lava	Late Tertiary or early Quaternary	Light to very ligry-gray vesicular lava. Removed from final map			TN002	451	Tanana	Ign	451	QTa
Tvs	Rhyolitic volcanic and sedimentary rocks	Tertiary?	Rhyolitic lava and breccia. Tuff and welded tuff common. Cherty rocks minor, thin-bedded or in nodules.			TN002	1001	Tanana	Ign	1001	Trs
Ts	Sedimentary rocks	early Tertiary and Miocene	Interbedded polymictic pebble-cobble-boulder conglomerate, grit, and sandstone, with siltstone, shale, and lignite.			TN002	640	Tanana	Sed	640	Tcb
TKv	Volcanic rocks	Late Cretaceous and Early Tertiary	Dacite flows, may include tuff and andesite.			TN002	1604	Tanana	Ign	1604	TKvd
KJcs	Clastic sedimentary rocks	Late Jurassic and Cretaceous	Graywacke sandstone, quartzitic sandstone, quartzite, siltstone, shale, slate, slaty argillite, and polymictic conglomerate.			TN002	2815	Tanana	Sed	2105	Kvgm
JMms	Mafic and sedimentary rocks	Jurassic? to Mississippian	Rampart Group volcanic and sedimentary rock sequence			TN002	5131	Tanana	Ign	5131	TrMtsu
Ps	Slaty shale, siltstone, graywacke, and conglomerate	Permian	Moderately well-indurated, medium- to dark-gray shale, commonly weakly foliated to slaty, and in part phyllitic. Well indurated, medium- to medium-drak-gray siltstone, in part argillite.			TN002	5740	Tanana	Sed	5012	TrPs
Pzar	Argillaceous rocks	Permian or Middle to Late Devonian	Thin-bedded siltstone, slate, and phyllite, thick-bedded argillite, and minor laminated sandstone. Metamorphosed to low grade. Not on published OFR98-133			TN002	5615	Tanana	Sed	5615	PDms
Pzc	Calcareous clastic rocks	early Paleozoic, possibly Devonian	Medium-gray siltstone and very fine-grained sandstone, largely calcareous and generally schistose. Not on OFR98-133			TN002	6921	Tanana	Meta	6921	Dq?
Pzw	Quartz wacke	early Paleozoic, possibly Devonian	Poorly sorted sandstone, granule conglomerate, siltstone, and semischist. Not on OFR98-133			TN002	6922	Tanana	Meta	6922	Dq2?
Pzsr	Schistose rocks	middle Paleozoic?	Chiefly white, light- to medium-gray, silvery gray, and brownish gray, fine- to coarse-grained quartz-mica-grarnet schist. Unit apparently conformable with unit Pzl, but contact is poorly exposed.			TN002	5208	Tanana	Meta	5208	TPza

Rock unit	Unit hame	Age	Description	Fossil	Radiometric age	Source code	Class code	Quadrangle	Rock class	NSA class	Label
Pzl	Limestone, greenstone, and schist	Ordovician(?), Silurian, and Devonian	Dominantly light- to light-medium-gray partly dolomitic limestone and dolomite. Basaltic greenstone and partly calcareous chloritic schist are associated sequentially or interbedded with the carbonate rocks			TN002	6966	Tanana	Meta	6966	DSt?
Pzvs	Volcanic and sedimentary rocks	Ordovician or Silurian	Partly altered mafic lava and tuff, slate, slaty shale, phyllite, tuffaceous limestone, cherty schist, and chert. Not on OFR98-133			TN002	6910	Tanana	Meta	6910	Dtr
Pzl	Limestone, dolomite, greenstone, and schist	Silurian or Devonian	Limestone, dolomitic limestone, partly silicified dolomite, basaltic greenstone, and chloritic schist. Similar to unit Pzl south of Yukon River.			TN002	6956	Tanana	Meta	6956	DSls?
Oc	Chert	Late(?) Ordovician	Light- to medium-gray chert.			TN002	7710	Tanana	Meta	7710	Och
Cal	Argillite, slate, quartzite and grit	probably Cambrian, possibly in part preCambrian	Medium- to dark-red or maroon, light- to medium-green and grayish-green, and medium-gray argillite and slate. Light yellow-brown to light-gray quartzite and grit. Not on OFR98-133			TN002	8410	Tanana	Meta	8310	CZwa
PzpCsq	Schist, quartzite, phyllite, and slate	early Paleozoic(?) and preCambrian(?)	Light- to medium-gray and silvery gray quartz-mica schist, light- to medium-gray quartzite, light- to dark-gray slate and phyllite. Not on OFR98-133			TN002	8630	Tanana	Meta	8630	PzZysa
Tg	Granite	early Tertiary	Light-gray biotite granite, only at Manley Hot Springs		K-Ar(?) 62 Ma	TN002	2470	Tanana	Ign	1320	Tpgr
TKq	Quartz monzonite	Early Tertiary-Late Cretaceous	Light- to vey light-gray quartz monzonite, may range to granite		K-Ar(?) 61.8 Ma	TN002	1655	Tanana	Ign	1655	TKg
Kg	Granitic rocks	Late Cretaceous	Quartz monzonite, granite, monzonite, and possibly granodiorite		K-Ar(?) 92, and 90 Ma; 104 Ma	TN002	2470	Tanana	Ign	2470	Kg
Km	Mafic rocks	Cretaceous?	Gabbro, diorite? Not on published OFR98-133			TN002	2440	Tanana	Ign	2440	Kmum
Ksp	Serpentinite and mafic rocks	Late Cretaceous?	Serpentinite, diabase-gabbro and some metadiorite. Not on published OFR98-133			TN002	2510	Tanana	Ign	2510	Kmum
Jpu	Ultramafic rocks		Serpentinized peridotite and dunite			TN002	5150	Tanana	Ign	5150	Jaum
Mg	Globe unit	Mississippian	Light-gray quartzite. Massive or thinly interbedded quartzite and medium- to dark-gray slate, phyllite, and minor laminated claystone. Age fro date of Trm intrusive and lithologic and stratigraphic similarities to Keno Hill Quartzite in Yukon.			LG002	830	Livengood	Meta	6530	Mgq
Dcg	Beaver Bend unit	Devonian?	Polymictic light- to medium-gray chert pebble conglomerate, graywacke, siltstone, and slate	Unidentifiable plant fragments		LG002	843	Livengood	Sed	6940	Dcb
bu	bedrock of unknown type or age	unknown	Rubble of metasiltstone and chert, believed to be older than TKf. Also includes an outcrop of white, very fine grained quartz sandstone			KH002	99	Kantishna River		99	bu
Da	Augen gneiss	Devonian	Biotite-bearing felsic augen gneiss		U/Pb age 387 +/- 43 Ma, protolith(?) age	CI002	702	Circle	Ign	6521	MDyao
Kg	Granitic rocks	Cretaceous	Not on OF98-133			KH003	2410	Kantishna River	Ign	2410	Kg
Km	Gabbro and diorite	Cretaceous	Not on OF98-133			KH003	2440	Kantishna River	Ign	2440	Kmum
Ksp	Serpentinite with some diabase, gabbro and mafic volcaniclastic rocks	Cretaceous	Serpentinite with some diabase, gabbro and mafic volcaniclastic rocks. Not on OF98-133			KH003	2445	Kantishna River	Ign	2445	Kmum

Rock unit	Unit hame	Age	Description	Fossil	Radiometric age	Source code	Class code	Quadrangle	Rock class	NSA class	Label
MzPzc	Circle Volcanics	Triassic and Penn. or Mississippian	Diabasic gabbro, basalt, diorite, ultramafic rocks, chert, and tuff. Rare limestone. Probably correlative with Rampart Group	Radiolarians from chert of Pennsylvanian, Mississippian, and Triassic age.		CI002	502	Circle	Ign	5130	JTrtmu
MzPzd	Diorite	Mesozoic and/or Paleozoic	Green, olive-green, or greenish-brown, medium- to very coarse-grained, porphyritic diorite.			CI002	503	Circle	Ign	5175	MzPzi
Pzp	Serpentinized periodotite	Paleozoic	Gray, green, and greenish-gray to greenish-black, fine- to coarse-grained serpentinized peridotite.			CI002	608	Circle	Ign	5980	JPsu
Pzug	Ultramafic and mafic rocks and greenstone	Paleozoic	Mostly greenish-black serpentinized peridotite. Greenstone consists of metamorphosed basalt and tuff.			CI002	600	Circle	Ign	8250	CZum
QTa	Andesitic lava	Quaternary and/or Tertiary				KH003	451	Kantishna River	Ign	451	QTa
Tg	Granite	Tertiary				KH003	1203	Kantishna River	Ign	1320	Tpgr
TKa	Andesitic rocks	Tertiary and/ or Cretaceous	Andesite and trachyandesite are medium to light green and grayish green and weather to dull brown and brownish green; fine to very fine-grained, prophyritic and glomeroporphyritic, abundant plagioclase phenocrysts 5-6 mm.			KH002	1605	Kantishna River	Ign	1605	TKvi
TKf	Felsic igneous rocks	Tertiary and/or Cretaceous	Light-gray weather, gray ot tan fine- to coarse-grained quartz porphyry. Hypabyssal(?)			CI002	301	Circle	Ign	1602	TKgp
TKf	Felsic extrusive rocks and tuff	Tertiary and/ or Cretaceous	Very light to light gray, yellow and pink to red, mostly deeply weathered and in part iron-stained. Rhyolitic and andesitic rocks are very fine-grained to aphanitic, porphyritic in part; tuff resembles rhyolitic rocks may be welded in places			KH002	1600	Kantishna River	Ign	1603	TKvr
TKg	Granite	Tertiary and/or Cretaceous	Mostly light- to medium-gray, hypidiomorphic granular to porphyritic granite		A number of K-Ar mineral ages (see Wilson and Shew, 1981), virtually all early Tertiary, 58 to 65 Ma	CI002	300	Circle	Ign	1655	TKg
TKg	Granite	Tertiary and/ or Cretaceous	Monzonite, quartz monzonite, syenite, diorite, and quartz diorite; generally light to medium dark gray and weather to various shades of brown and gray			KH002	1655	Kantishna River	Ign	1655	TKg
TKr	Rhyolitic volcanic rocks	Tertiary and/ or Cretaceous	Rhyolite porphyry is light to very light gray, mostly deeply weatered to light to medium yellow and reddish brown; very fine-grained, small phenocrysts of smoky quartz and kaolinized feldspar			KH002	1603	Kantishna River	Ign	1603	TKvr
TKv	Felsic volcanic rocks	Tertiary and/or Cretaceous				KH003	1600	Kantishna River	Ign	1603	TKvr
Trm	Diabase and basalt	Triassic (?)	Light- to medium-green and weathered to various shades of yellowish brown, reddish brown, and brown diabase and basalt. Diabase is medium to coarse grained, in part porphyritic, very hard and breaks into angular blocks; basalt is very fine grained to aphanitic, not as hard as diabase and finely fractured.			KH002	4210	Kantishna River	Ign	4210	Trn

Rock unit	Unit hame	Age	Description	Fossil	Radiometric age	Source code	Class code	Quadrangle	Rock class	NSA class	Label
PzpCb	Basalt and limestone	Paleozoic	Dark-greenish- or bluish-gray, medium-fine-grained calcareous basalt, having locally well-developed pillows. Thin limestone layers at the base of the basalt. Upper units in basalt amygdaloidal, overlain by greenish-brown breccia of calcareous basalt having an opaline matrix. Black, moderately coarsely crystalline limestone overlies basaltic portion of unit. Overlying limestone is tan and brown dolomite, and dolomite containing gray chert fragments inturn overlain by gray shale, gray recrystallized chert, and calcareous basalt. Dolomite and limestone contact may be a fault.			CI002	1200	Circle	Ign	6680	SZa
Pzvs	Foliated basaltic lava, tuff, slaty shale, phyllite and some limestone and chert	Early Paleozoic	Not on OFR98-133			KH003	5410	Kantishna River	Ign	5410	Pzvs
TrPv	Basaltic and diabasic rocks, tuff, chert, argillite, slate, and rarely clastic limestone	Triassic and/or Permian	Extrusive and intrusive basaltic and diabasic rocks, tuff, chert, argillite, slate, and rarely clastic limestone. Not on OFR98-133			KH003	5140	Kantishna River	Ign	5140	JMab
Trvs	Rhyolitic lava and breccia, tuff, chert and shale	Triassic	Unit deleted in going to TN003			KH003	4205	Kantishna River	Ign	4205	Trvs
Cal	Argillite and slate	Cambrian	Maroon and green argillite and slate with quartzite, grit, and some phyllite			KH003	8410	Kantishna River	Meta	8300	CZw
Cqs	Quartzite, metasiltstone, slate and grit	Cambrian	Range from light to dark gray ; quartzite is very fine-grained and grades to metasiltstone; blocky, irregular fractures, schistose in part; Slate and phyllite are medium gray; banded with thin silty or sandy layers in part.			KH002	8420	Kantishna River	Meta	8300	CZw
Dps	Phyllite,slate, silicious siltstone, and argillite	Late Devonian	Light and medium gray to silvery gray phyllite,slate, silicious siltstone and argillite; alters to hornfels near granitic contacts. Includes some thin limestone and calcareous siltstone.			KH002	7210	Kantishna River	Meta	6902	Dp
Kh	Hornfels and gneiss	Cretaceous	Unit removed on DOG map			KH003	2640	Kantishna River	Meta	2640	Khg
MzPzaq	Argillite and quartzite	Mesozoic and/or Paleozoic	Dark-gray to black, locally quartzitic argillite, mudstone, and siltstone. Calcareous in a few places, has local gray and black chert. Unit includes a gray, very fine-grained limestone at one locality. Dark greenish-gray mafic lavas, including amygdaloidal basalt and basalt breccia appear interlayered with the sedimentary rocks. Unit deleted on published map.	Conodonts in limestone range in age from Ordivician to Triassic		CI002	501	Circle	Meta	5211	MzPzaq
Pze	Eclogite	Paleozoic	Medium-green, medium-grained, massive to foliated ecologite. Occurs as mafic layers within unit PzpCms (NSACLASS = 5510), garnet-muscovite-schist, within which it is lumped on published map.			CI002	610	Circle	Meta	5475	Pze
Pzg	Greenstone	Paleozoic	Mostly coarse diabasic gabbros. Small individual outcrop areas of a variety of texturally and mineralogically different rocks. Unit removed from published (OFR98-133) map and from various versions of Foster and others map. To be reinstated.			CI002	609	Circle	Meta	5640	JPzsgs

Rock unit	Unit hame	Age	Description	Fossil	Radiometric age	Source code	Class code	Quadrangle	Rock class	NSA class	Label
Pzm	Phyllite, calcareous phyllite and marble	Paleozoic	Gray phyllite containing thin stringers of crumbly impure marble and black or gray quartzitic phyllite. May includes rocks of unit Pzq (NSACLASS = 5500).			CI002	607	Circle	Meta	5662	Pzkcp
PzpCa	Argillite, grit, and quartzite	Paleozoic and/or Precambrian	Gray, maroon, and green slaty argillite interlayered with gray and greenish-gray grit and quartzite. Minor limestone in southern part of exposure.			CI002	1000	Circle	Meta	8300	CZw
PzpCgq	Grit, quartzite and argillite	Paleozoic and/or Precambrian	Mostly gray or greenish-gray, but may be tan, brown, or dark-gray grit and quartzite. Ranges from fine- to coarse-grained, rarely conglomeratic, and equigranular to bimodal. Weakly metamorphosed. Gray to black, or greenish-gray, olive-gray, tan or brown argillite. Rare thin layers of gray and dark-gray limestone.	Trace fossil Oldhamia suggests a Cambrian or possibly Hadrynian (late pC age).		CI002	1100	Circle	Sed	8410	Zwg
PzpCgr	Grit and quartzite	Paleozoic and/or Precambrian	Tan or gray grit and quartzite. Lower metamorphic grade and more calcareous than unit PzpCgq, but thought may be correlative.			CI002	1800	Circle	Meta	6511	MDt?
PzpCm	Mafic schist	Paleozoic and/or Precambrian	Green, chlorite-quartz-carbonate schist, associated with amphibolitic schist and mionr marble, quartzite, and pelitic schist.			CI002	1700	Circle	Meta	8660	PzZms
PzpCms	Garnet-muscovite schist	Paleozoic and/or Precambrian	Medium- to coarse-grained muscovite-garnet-quartz-plagioclase schist.			CI002	1400	Circle	Meta	5510	Pze
PzpCq	Quartzite and quartzitic schists, calc-silicate and marble subunit	Paleozoic and/or Precambrian	Light green to greenish-gray calc-silicate containing thin interlayers of crumbly, greenish-gray marble, light-green calcareous quartzite, gray and greenish-gray phyllite, and fine-grained quartzitic schist subunit of unit PzpCq, consisiting of gray or greenish-gray quartzite and quartzitic schists are dominant rock types. Minor pelitic schist, calc-silicate, mafic schist, and rare marble are interlayered with quartzite and quartzitic schists.			CI002	1600?	Circle	Meta	9324	PzZyqs
PzpCs	Pelitic schist	Paleozoic and/or Precambrian	Mostly medium- to coarse-grained pelitic schist and gneiss, having minor interlayered quartzite and quartzitic schists and subordinate white and cream-colored, coarse-grained marble.			CI002	1300	Circle	Meta	8630	PzZysa
Pzq	Quartzite, meta-argillite and phyllite	Paleozoic	Black, dark-gray, or gray. Quartzite is medium-grained, thinly layered to massive. Meta-argillite may be slaty. Unit cut by abundant white quartz veins. Stratigraphically overlies calcareous phyllite and marble unit (Pzm, NSACLASS = 5545)			CI002	606	Circle	Meta	5660	Pzk
Pzsl	Schist, phyllite, limestone, and greenstone	Early Paleozoic	Schist and phyllite are light to medium green and light to medium gray; chlorite and mica common, partly calcareous intensely folded, interbedded with limestone. Limestone is light and medium gray, largely recrystallized; greenstone is basaltic, light to medium green gradational to greenschist.			KH002	5665	Kantishna River	Meta	6956	DSls?
Pzsr	Quartz -mica-garnet schist, with some quartzite schist, calcareous schist, marble and phyllite	Paleozoic	Not on OFR98-133			KH003	5208	Kantishna River	Meta	5208	TPza

Rock unit	Unit hame	Age	Description	Fossil	Radiometric age	Source code	Class code	Quadrangle	Rock class	NSA class	Label
KJqa	Quartzite, argilllite, conglomerate, and hornfels	Cretaceous and/or Jurassic	Mostly gray, fine- to medium-grained quartzite, interlayered with mostly gray, greenish-gray, reddish-gray, and tan argillite			CI002	400	Circle	Meta	2815	KJw
MzPzat	Argillite, tuff, quartzite and conglomerate	Mesozoic and/or Paleozoic	Two parts. One include rocks around VABM Vrain, composed mostly of argillite and minor quartzite and slaty argillite. Second shown by ttt symbol is characterized by tuffaceous rocks associated with black or dark-gray argillite and conglomerate. VRAIN equivalent, see MzPztu also for tuffaceous part of unit. Part of unit separated and assigned to Dcb, combined Cascaden Ridge -- Beaver Bend unit, per Florence Weber's revisions.			CI002	400	Circle	Meta	2860	KJvr
Dl	Limestone	Devonian	Medium-gray, generally massive, locally recrystallized limestone. Correlative with Tolovana limestone?	Stromatoporoids, corals, and condonts, result in earliest Early Devonian age. Another part of unit(?), has corals restricting age to late Early Devonian.		CI002	701	Circle	Sed	6944	DSl
Dls	Limestone and siltstone	Devonian	Chiefly limestone, medium to dark gray; dolomitic in part; Siltstone is medium gray, shaly to phyllitic	Phillipsastrea or Pachyphyllum sp. (massive rugose coral) and Thamnopora sp. and Disphyllum? sp.		KH002	6945	Kantishna River	Sed	6944	DSl
DSd	Dolomite and argillite	Devonian and/or Silurian	Mostly yellow-gray dolomite and moslty gray and dark-gray to black argillite, shale, and siltstone. Interlayered with light- and dark-gray chert, yellow-gray dolomite, gray marble, and gray, fine-grained quartzite.			CI002	700	Circle	Sed	6681	SZa?
DSl	Limestone, dolomite, and shale	Devonian and/or Silurian	Medium-light- to dark-gray, fine- to medium-grained limestone. Locally limstone contains interlayered minor dolomite and dark-gray shale. Correlates with Tolovana Limestone of Livengood quadrangle.			CI002	703	Circle	Sed	6945	Ds
DSt	Tolovana Limestone	Devonian and/or Silurian				KH003	6965	Kantishna River	Sed	6965	DSt
KJcs	Sandstone, quartzite, conglomerate, siltstone, and slaty shale	Cretaceous and/or Jurassic				KH003	2820	Kantishna River	Sed	2115	Kwcf
KJgs	Graywacke and shale	Jurassic and/or Cretaceous	Sandstone, siltstone, and shale, medium gray, generally thin bedded			KH002	2116	Kantishna River	Sed	2115	Kwcf
Oc	Chert and slate	Ordovician	Medium to medium dark gray and weathers to light yellow, tan and orange			KH002	7550	Kantishna River	Sed	7710	Och
Oc	Chert and some slaty slate	Ordovician				KH003	7510	Kantishna River	Sed	7710	Och
OCsl	Siltstone. limestone, phyllite and chert	Ordovician and/or Cambrian	Mostly light-medium to dark gray and weather yellow, brown and gray; thin bedded; chert rare			KH002	7580	Kantishna River	Sed	7580	SCpl
Old	Livengood Dome (?) Chert	Ordovician	Dark-gray and black chert, gray argillite and shale and slate, gray dolomite, and minor greenish-gray, dirty and dark-gray recrystallized limestone. Mafic volcanic rocks.			CI002	900	Circle	Sed	7710	Och

Rock unit	Unit hame	Age	Description	Fossil	Radiometric age	Source code	Class code	Quadrangle	Rock class	NSA class	Label
Ps	Slaty shale, siltstone, graywacke, and conglomerate	Permian	Not on OFR98-133			KH003	5740	Kantishna River	Sed	5740	Ps
Pzcc	Chert, conglomerate and limestone	Paleozoic	Chert and chert-pebble conglmerate most characteristic. Chert is dominantly gray or black, locally massive, commonly brecciated.	Interlayered limestone contained late Late Devonian conodonts		CI002	603	Circle	Sed	6940	Dcb
Pzcg	Chert pebble conglomerate	Paleozoic	Mostly gray chert pebble conglomerate. Conglomerate clasts dominantly chert but include minor quartz, quartzite and rare argillite and siltstone fragments	Poorly preserved radiolarins (Spumellariina) of indeterminate age.		CI002	602	Circle	Sed	6940	Dcb
Pzl	Limestone and chert	Paleozoic	Two separate(?) units. Eastern unit is light-gray to medium-dark-gray at top, mostly fine-grained, partly recrystallized, blocky fracturing limestone. Possible algal structures. Western unit ranges from light- to dark-gray limestone apparently interlayered with black, gray, and mottled chert, tan and gray argillite, amygdaloidal basalt, and gabbro.			CI002	605	Circle	Sed	5330	Pzlc
Pzw	Quartz wacke	Paleozoic				KH003	6922	Kantishna River	Sed	6922	Dq2?
Tcs	Conglomerate and sandstone	Tertiary	Mostly gray or tan, but locally pink or orange-brown conglomerate. Ranges in grainsize from coarse to fine, grades into sandstone. Sandstone is gray, tan, iron-oxide stained, commonly with "salt and pepper" appearance, fine to coarse-grained and locally slightly argillaceous. Locally chunks of lignite and coal(?) are found in float associated with unit.			CI002	200	Circle	Sed	500	Tsu
SOs	Siltstone, dolomite, chert, and mafic igneous rocks	Silurian and/or Ordovician	Gray, black, or olive-gray siltstone and argillite and mudstone. Tan dolomite, gray to dark-gray fine-grained limestone, gray or dark-gray chert. Mafic igneous rocks are dikes, sills, and small lense-like bodies of dark-greenish-black gabbro and basalt. Two areas of exposure, northern contains chert, southern mafic igneous rocks; as assigned an NSAclass, this corresponds to northern area of exposure.			CI002	800	Circle	Ign	7010	Dsv
PaMc	Chert, argillite, and quartzite	Penn. and/or Mississippian	Mostly black, gray, and dark-gray chert, also includes light-gray, green and white banded chert. Rare gray, dark-gray, and black argillite, shale, slate, and siltstone and gray quartzite. Unit form east trending belt in east Crazy Mountains. Maybe be part of Circle Volcanics, or in contact (conformable, unconformable or fault)	Radiolarian, Albaillella sp., and Paronaella impella Ormiston and Lane of Late Mississippian age. Also Spongodiscaceid gen. nov. (tetrahedral) of latest Late Mississippian or Early Pennsylvanian age.		CI002	601	Circle	Meta	5020	TrMts
Pzc	Chert and argillite	Paleozoic	Gray, black, and banded chert interlayered with gray, green, olive, black, gray, and tan argillite, rare gray marble, white quartzite, and white calcareous quartzite. Locally intruded by drak-greenish-gray to black diorite and gabbro.	Poorly preserved radiolaria, Spumellariina, possibly of Mississippian age.		CI002	604	Circle	Meta	6910	Dtr

Rock unit	Unit hame	Age	Description	Fossil	Radiometric age	Source code	Class code	Quadrangle	Rock class	NSA class	Label
Pzc	Calcareous schistose siltstone and sandstone, and some phyllite	Paleozoic	Not on OFR98-133			KH003	5542	Kantishna River	Meta	5542	TrMtqp
Pzcs	Siltstone, slate, phyllite, and argillite	Paleozoic	Siltstone, slate, phyllite, and argillite			KH003	7210	Kantishna River	Meta	8300	CZw
Pzl	Limestone, dolomite, basaltic greenstone and chloritic schist	Early Paleozoic	Limestone, dolomite, basaltic greenstone and chloritic schist; some argillite, phyllite and quartz-mica schist			KH003	6956	Kantishna River	Sed	8601	PzZrqs
PzpCd	Dolomite and marble	Paleozoic and/or Precambrian	Gray to cream-colored massive dolomite, gray or greenish-gray marble interlayered in calcareous greenish-gray and gray quartzite and phyllite and greenish-gray calc-silicate.			CI002	1500	Circle	Meta	8615	Pzydm
Qa	Alluvium	Quaternary	Gravel, sand, and silt, gray, buff, or brown. Unconsolidated, well-sorted, well-stratified.			CI002	100	Circle	Unconsol	100	Qs
Qab	Abandoned flood plain alluvium	Quaternary	Gray to brown gravel, granule to boulder size, well-sorted, well-stratified, covered with as much as 8 m of silt and organice material. Perennially frozen.			CI002	101	Circle	Unconsol	100	Qs
Qac	Alluvium and colluvium	Quaternary	Boulders, gravel, sand, silt, and angular rock fragments, mostly poorly sorted and poorly stratified.			CI002	102	Circle	Unconsol	100	Qs
Qaf	Alluvial fan deposits	Quaternary	Gray, tan, and brown sandy pebble-cobble gravel and pebble-cobble-boulder gravel having lenses and layers of sand, silt, and organic material.			CI002	103	Circle	Unconsol	100	Qs
Qaf	Fan deposits	Quaternary	Gravel, silt and sand, coarse clastics subangular to subrounded			KH002	100	Kantishna River	Unconsol	100	Qs
Qaf	Alluvial Fan deposits	Quaternary				KH003	100	Kantishna River	Unconsol	100	Qs
Qags	Older alluvium	Quaternary				KH003	100	Kantishna River	Unconsol	100	Qs
Qal	Alluvium	Quaternary	Sandy gravel and sandy silt; coarse clastics subrounded to well rounded			KH002	100	Kantishna River	Unconsol	100	Qs
Qal	Recent Alluvium	Quaternary				KH003	100	Kantishna River	Unconsol	100	Qs
Qat	Altiplanation terrace	Quaternary	Flat, even surface, cut on bedrock in high areas; generally less than 2 hectares in area; thin mantle of coarse, angular rock fragments			KH002	161	Kantishna River	Unconsol	100	Qs
Qat	Altiplanation terrace	Quaternary				KH003	161	Kantishna River	Unconsol	100	Qs
Qb	Rock-defended terraces on Minook Creek	Quaternary				KH003	160	Kantishna River	Unconsol	100	Qs
Qbg	Low-level bench gravel of Minook Creek	Quaternary				KH003	100	Kantishna River	Unconsol	100	Qs
Qc	Colluvium, undifferentiated	Quaternary	Predominately silt with some larger fragments, commonly poorly sorted			KH002	107	Kantishna River	Unconsol	100	Qs
Qc	Colluvium, undifferentiated	Quaternary				KH003	107	Kantishna River	Unconsol	100	Qs
Qcal	Colluvium and alluvium, undifferentiated	Quaternary				KH003	100	Kantishna River	Unconsol	100	Qs
Qess	Sand and silt	Quaternary	Elongate dunes			KH002	120	Kantishna River	Unconsol	100	Qs
Qess	Sand and silt	Quaternary				KH003	120	Kantishna River	Unconsol	100	Qs
Qg	Gravel	Quaternary	Light-gray to light-yellowish-brown, pebble to boulder size, containing thin layers of sand and silt. Probably was at one time large alluvial fan of Yukon River.			CI002	106	Circle	Unconsol	100	Qs

Rock unit	Unit hame	Age	Description	Fossil	Radiometric age	Source code	Class code	Quadrangle	Rock class	NSA class	Label
Ql	Loess	Quaternary	Silt and sandy silt, eolian, yellowish-gray to light-gray. Well-sorted, homogeneous, unconsolidated, generally perennially frozen.			CI002	107	Circle	Unconsol	100	Qs
Ql	Loess	Quaternary				KH003	121	Kantishna River	Unconsol	100	Qs
Qlc	Clay, silt, sand and gravel	Quaternary	Well-bedded lake deposits; at least 60 m thick			KH002	112	Kantishna River	Unconsol	100	Qs
Qls	Older landslide deposits	Quaternary				KH003	108	Kantishna River	Unconsol	100	Qs
Qm	Morainal deposits, undifferentiated	Quaternary	Boulders, gravel, sand, silty sand in terminal, lateral, cirque and ground moraine.			CI002	108	Circle	Unconsol	100	Qs
Qoa	Older alluvium	Quaternary	Sandy gravel and sandy silt; represents old floodplains			KH002	100	Kantishna River	Unconsol	100	Qs
Qrs	Recent slide and slump deposits	Quaternary				KH003	100	Kantishna River	Unconsol	100	Qs
Qs	Silt and peat	Quaternary	Organic silt deposited in swamps. Black, dark-gray, mottled dark-gray and brown. Mostly perennially frozen.			CI002	104	Circle	Unconsol	100	Qs
Qs	Silt	Quaternary	Probably includes both loess and solifluction mantle. Lakes are common. Units separated by low, elongated hills which are probably dunes			KH002	122	Kantishna River	Unconsol	100	Qs
Qsf	Solifluction mantle	Quaternary	Silt ,some sand, and a small amount of bedrock fragments			KH002	128	Kantishna River	Unconsol	100	Qs
Qsu	Silt, undifferentiated and organic material	Quaternary	Gray, dark-gray, dark-brown or black silt, organic silt, and peat, containing local sandy lenses and layers. Locally highly organic, generally perennially frozen. Up to 60 m thick.			CI002	105	Circle	Unconsol	100	Qs
Qt	Till, undifferentiated	Quaternary				KH003	125	Kantishna River	Unconsol	100	Qs
Qt (1)	Till	Quaternary				KH003	138	Kantishna River	Unconsol	100	Qs
Qt (2)	Till	Quaternary				KH003	137	Kantishna River	Unconsol	100	Qs
Qt (3)	Till	Quaternary				KH003	136	Kantishna River	Unconsol	100	Qs
Qt (4)	Till, cirque glaciation	Quaternary				KH003	130	Kantishna River	Unconsol	100	Qs
Qta	Talus	Quaternary				KH003	107	Kantishna River	Unconsol	100	Qs
QTg	High-level gravel	Quaternary				KH003	285	Kantishna River	Unconsol	100	Qs
Qtr	Terrace deposits	Quaternary				KH003	110	Kantishna River	Unconsol	100	Qs
Qal	Active stream alluvium	Quaternary	Active stream alluvium			SM002	105	Sleetmute	Unconsol	100	Qs
Qg3	Ground and medial moraine	Pleistocene	Ground and medial moraines interpreted from aerial photographs			SM002	136	Sleetmute	Unconsol	100	Qs
Qg2	Ground and medial moraine	Pleistocene	Ground and medial moraines interpreted from aerial photographs			SM002	137	Sleetmute	Unconsol	100	Qs
Qg1	Ground and medial moraine	Pleistocene	Ground and medial moraines interpreted from aerial photographs			SM002	138	Sleetmute	Unconsol	100	Qs
Qou	Glacial outwash deposits	Pleistocene	Glacial outwash deposits			SM002	140	Sleetmute	Unconsol	100	Qs
Qg	Undifferentiated glacial deposits	Pleistocene	Undifferentiated glacial deposits			SM002	135	Sleetmute	Unconsol	100	Qs
Qu	Undifferentiated alluvial, colluvial, and eolian deposits	Quaternary	Undifferentiated alluvial, colluvial, and eolian deposits			SM002	100	Sleetmute	Unconsol	100	Qs
Tb	Columnar basalt	Tertiary	Cloumnar basalt, exposed 9 mi northeast of Fortyseven Creek landing strip.		K-Ar whole-rock, 38.2 Ma	SM002	1004	Sleetmute	Ign	1004	Tb

Rock unit	Unit hame	Age	Description	Fossil	Radiometric age	Source code	Class code	Quadrangle	Rock class	NSA class	Label
Tg	Small stocks	Tertiary	Small stocks, chiefly quartz monzonite, exposed in southeast corner of quadrangle.		K-Ar biotite 41.7 Ma	SM002	1300	Sleetmute	Ign	1300	Tegr
TKr	Sheets, dikes, and sills of rhyolite	early Tertiary, Late Cretaceous	Sheets, dikes, and sills of peraluminous biotite + muscovite rhyolite.		Six K-Ar biotite and whole-rock ages ranging from 61.5 to 70.5 Ma	SM002	1603	Sleetmute	Ign	1603	TKvr
TKd	Dikes and sills	early Tertiary, Late Cretaceous?	Dikes and thin sills of felsic to mafic composition mostly altered to carbonate, quartz, sericite, and clay. Age based on intrusive relationship with late Early to Late Cretaceous sedimentary rocks (unit Kk, Kuskokwim Group).			SM002	1601	Sleetmute	Ign	1601	TKd
TKvf	Felsic volcanic rocks	early Tertiary, Late Cretaceous?	Felsic volcanic rocks associated with volcano-plutonic complexes, primarily composed of rhyolite tuffs and flows. Equivalent in part to Getmuna Rhyolite of Cady and others (1955) and Holokuk Basalt of Reifenstuhl and others (1984)		K-Ar whole-rock of 43.8 Ma	SM002	1625	Sleetmute	Ign	1625	TKvr
TKv	Mafic volcanic rocks	early Tertiary, Late Cretaceous	Mafic volcanic rocks associated with volcano-plutonic complexes; lower unit of TKvf/TKv group. Composed of flows and lesser tuff, agglomerate, and minor lahar units of dominatly mafic composition. Intermediate and felsic rocks also present. Named Holokuk Basalt by Cady and others (1955).		Seven K-Ar ages on plagioclase and whole rocks range from 64.3 to 74.5 Ma	SM002	1630	Sleetmute	Ign	1630	TKiv
TKg	Plutonic rocks	early Tertiary, Late Cretaceous	Plutonic rocks associated with volcano-plutonic complexes, monzonite, quartz monzonite, granodiorite, and granite stocks and minor dikes of mafic to felsic composition.		Six K-Ar ages on biotite and hornblende range from 63.8 to 68.9 Ma	SM002	1650	Sleetmute	Ign	1650	TKi
Kk	Kuskokwim Group	late Early Cretaceous to Late Cretaceous	Interbedded sandstone, siltstone, shale, and minor conglomerate. Primarily submarine fan and turbidite association.	Rare fossils constrin age.		SM002	1970	Sleetmute	Sed	1970	Kk
KTrg	Gemuk Group	Cretaceous to Triassic	Chiefly siltstone, interbedded with lesser amounts of chert and volcanic rock (including tuff), and minor limestone, graywacke, and breccia.	Early Cretaceous and Cretaceous fossils from map area, Late Triassic found to southwest.		SM002	4710	Sleetmute	Sed	4710	MzPzgs
Pzl	Holitna Group	Middle Cambrian to early Middle Devonian	Limestone, in partly dolomitized, chiefly massive but thinner bedded in upper zones. Contains small reef-like deposits and local intraformational conglomerate and breccia.	Stromatopora sp., Favosites sp., Monotrypa sp., Spirifer (Emmanuella?) sp., Athyris sp., Productella sp., Proetus sp., trilobites, Cyathophylloid corals		SM002	6960	Sleetmute	Sed	6960	DSwc
MzPzat	Argillite, tuff, quartzite and conglomerate	Mesozic and/or Paleozoic	Two parts, tuffaceous part of unit, see KJvr also for main part of unit. One includes rocks around VABM Vrain, composed mostly of argillite and minor quartzite and slaty argillite. Second shown by ttt symbol is characterized by tuffaceous rocks associated with black or dark-gray argillite and conglomerate. Unit lumped and polygons removed on published map with KJvr, Vrain			CI002	550	Circle	Meta	2875	KJvt

Rock unit	Unit hame	Age	Description	Fossil	Radiometric age	Source code	Class code	Quadrangle	Rock class	NSA class	Label
MzPzaq	Argillite and quartzite	Mesozoic and/or Paleozoic	Vitreous quartzite part of unit, mapped separately. Light-gray, dense quartzite having a vitreous luster. Dark-gray to black, locally quartzitic argillite, mudstone, and siltstone. Calcareous in a few places, has local gray and black chert. Unit includes a gray, very fine-grained limestone at one locality. Dark greenish-gray mafic lavas, including amygdaloidal basalt and basalt breccia appear interlayered with the sedimentary rocks.	Conodonts in limestone range in age from Ordivician to Triassic		CI002	5000	Circle	Meta	6530	Mgq
PzpCq	Quartzite and quartzitic schists, quartzite subunit	Paleozoic and/or Precambrian	Light- to medium-gray, fine- to medium-grained relatively pure quartzite of unit PzpCq, which consists of gray or greenish-gray quartzite and quartzitic schists are dominant rock types. Minor pelitic schist, calc-silicate, mafic schist, and rare marble are interlayered with quartzite and quartzitic schists.			CI002	1610	Circle	Meta	9323	PzZyqs
PzpCq	Quartzite and quartzitic schists, greenschist subunit	Paleozoic and/or Precambrian	Green or greenish-gray, medium-grained, and massive to foliated greenschist subunit(?) of unit PzpCq, consisting of gray or greenish-gray quartzite and quartzitic schists are dominant rock types. Minor pelitic schist, calc-silicate, mafic schist, and rare marble are interlayered with quartzite and quartzitic schists. Unit not located on source map.			CI002	none	Circle	Meta	9326	PzZyqs
PzpCqm	Quartzite and quartzitic schists, magnetic chlorite schist subunit	Paleozoic and/or Precambrian	Magnetic chlorite schist subunit of unit PzpCq, consisiting of gray or greenish-gray quartzite and quartzitic schists are dominant rock types. Minor pelitic schist, calc-silicate, mafic schist, and rare marble are interlayered with quartzite and quartzitic schists. Similar lithologically to Cleary sequence of Bundtzen (1982)			CI002	1650	Circle	Meta	9321	PzZyqs
PzpCs	Pelitic schist, quartzite subunit	Paleozoic and/or Precambrian	Mostly medium- to coarse-grained pelitic schist and gneiss, having minor interlayered quartzite and quartzitic schists and subordinate white and cream-colored, coarse-grained marble.			CI002	1320	Circle	Meta	8802	PzZypg
PzpCs	Pelitic schist, sillimanite gneiss subunit	Paleozoic and/or Precambrian	Mostly medium- to coarse-grained pelitic schist and gneiss, having minor interlayered quartzite and quartzitic schists and subordinate white and cream-colored, coarse-grained marble.			CI002	1310	Circle	Meta	8632	PzZpg
unk	Limestone	Paleozoic and or preCambrian	Various limestone symbol shown on Circle map in a variety of rock units. No further description in text. Includes on northern polygons of unit			CI002	1900	Circle	Sed	8000	CZwl
unk	Chert	Paleozoic and or preCambrian	Various chert symbols shown on Circle map in a variety of rock units. No further description in text. Assigned to Cascaden on the basis of location.			CI002	1910	Circle	Sed	6940	Dcb
Qal	Alluvium	Quaternary				KH004	100	Kantishna River	Unconsol	100	Qs
Qc	Colluvium	Quaternary				KH004	101	Kantishna River	Unconsol	100	Qs
Qs	Silt	Quaternary				KH004	102	Kantishna River	Unconsol	100	Qs

Rock unit	Unit hame	Age	Description	Fossil	Radiometric age	Source code	Class code	Quadrangle	Rock class	NSA class	Label
Qdl	Dune sand and loess	Quaternary	Both medium- and fine-grained sand dunes, massive silt deposits, particularly on windward slopes, and relatively thin veneers of silt. The linear dunes trend SW, are commonly several km long and 8 to 20 m high, and have rounded tops.			KH004	103	Kantishna River	Unconsol	100	Qs
Ql	Lacustrine deposits	Quaternary				KH004	104	Kantishna River	Unconsol	100	Qs
Tn	Nenana gravel	Tertiary				KH004	570	Kantishna River	Unconsol	570	Tn
TKg	Granitic rocks	Tertiary				KH004	201	Kantishna River	Ign	1655	TKg
TKv	Volcanic rocks	Tertiary				KH004	202	Kantishna River	Ign	1603	TKvr
Dl	Limestone	Devonian				KH004	300	Kantishna River	Sed	6944	DSl
DSt	Tolovana limestone	Devonian				KH004	301	Kantishna River	Sed	6965	DSt
DOc	Chert	Devonian/Ordovican				KH004	302	Kantishna River	Sed	7710	Och
DOs	Shaly rocks	Devonian/Ordovican	Shaly rocks			KH004	303	Kantishna River	Sed	6902	Dp
pOlp	Limestone and phyllite	pre-Ordovican	Impure limestone, dolomite, greenish-gray phyllite, and silty shale, all of very low metamorphic grade.			KH004	400	Kantishna River	Sed	7580	SCpl
bu	Bedrock undifferentiated	pre-Ordovican				KH004	99	Kantishna River		99	bu
Qfy	Younger flood-plain deposits	Quaternary				NL003	100	Nulato	Unconsol	100	Qs
Qfo	Older flood-plain deposits	Quaternary				NL003	101	Nulato	Unconsol	100	Qs
Qhs	High-terraces and slope deposits	Quaternary				NL003	102	Nulato	Unconsol	100	Qs
Ta	Andesite and basalt flows	Eocene and Paleocene				NL003	200	Nulato	Ign	1000	Tvu
Tr	Rhyolite and dacite flows and shallow intrusive bodies	Eocene and Paleocene				NL003	201	Nulato	Ign	1000	Tvu
TKh	Small intrusive bodies of silicic and intermediate composition	Early Tertiary and Late Cretaceous				NL003	1655	Nulato	Ign	1655	TKg
Kgr	Biotite granite	Cretaceous				NL003	2410	Nulato	Ign	2530	Kg
TKhs	Small intrusive bodies and thermally altered sed. rx	Early Tertiary and Late Cretaceous	Small intrusive bodies and thermally altered sedimentary rocks of the Yukon-Koyokuk basin belonging to units Ks and Kg			NL003	203	Nulato	Ign	1655?	TKg
Ksu	Undifferentiated sedimentary rocks	Late and Early Cretaceous	Sandstone, shale, and conglomerate marine and nonmarine deltaic deposits in northwest part of quadrangle			NL003	1940	Nulato	Sed	2021	Kme
Km	Marine sedimentary rocks	Early Cretaceous	Sandstone, siltstone, and shale fossiliferous marine deltaic deposits			NL003	2101	Nulato	Sed	2101	Ksse
Kcs	Marine sedimentary rocks	Early Cretaceous	Calcareous sandstone, siltstone, and shale prodelta deposits			NL003	303	Nulato	Sed	2152	Km
Kg	Turbidite deposits	Early Cretaceous	Graywacke and mudstone turbidite deposits			NL003	2105	Nulato	Sed	2180	Kvm
Kv	Andesite volcanic rocks	Early Cretaceous				NL003	2220	Nulato	Ign	2330	Kve
Jcu	Cumulate ultramafic rocks	Middle and Late Jurassic				NL003	402	Nulato	Ign	3496	Jtu
Jht	Harzburgite tectonite	Middle and Late Jurassic				NL003	401	Nulato	Ign	3497	Jtu
Juu	Ultramafic rocks, undivided	Middle and Late Jurassic				NL003	301	Nulato	Ign	3498	Jtu

Rock unit	Unit hame	Age	Description	Fossil	Radiometric age	Source code	Class code	Quadrangle	Rock class	NSA class	Label
TrMb	Basalt, gabbro, diabase, tuff, and chert	Mississippian to Triassic				NL003	5133	Nulato	Ign	5130	JTrtmu
TrMq	Quartzite, phyllite, limestone	Mississippian to Triassic				NL003	5542	Nulato	Meta	5542	TrMtqp
PzpCs	Schist and quartzite	Paleozoic and Proterozoic?				NL003	8650	Nulato	Meta	8650	PzZrmc
PzpCc	Carbonate rocks	Paleozoic and Proterozoic?				NL003	8610	Nulato	Sed	8620	Pzrm
PzpCm	Metabasites	Paleozoic and Proterozoic?				NL003	8450	Nulato	Meta	8450	MzZum
ls	Landslide deposits	Quaternary?				NL003	100	Nulato	Unconsol	100	Qs
Kgs	Graywacke sandstone and mudstone -- volcanic conglomerate	Early(?) Cretaceous	Massive volcanic conglomerate mapped within unit or poorly sorted, muddy sandstone (graywacke) interbedded with mudstone. Conglomerate appears gradational with coarse breccias and agglomerates of andesitic volcanic rocks (unit KJv, KT quad.)	Associated and gradational(?) with units containing Buchia of earliest Cretaceous age.		KT002	202	Kateel River	Sed	2181	Kvm
TKv	Extrusive rocks	Cretaceous or Tertiary	Basaltic, andesitic, and rhyolitic flows, tuffs, and breccias, and a few dacite flows; interbedded sandstone and shale. Flows commonly porphyritic and gently dipping. Probably greater than 500 feet thick. (Description from RB002, should match on this map.)			RB003	202	Ruby	Ign	1603	TKvr
Qu	Alluvium	Quaternary	Silt, sand, and gravel of stream beds, flood plains, and terraces□□□□			RB003□	100	Ruby	Unconsol	100	Qs
JPb	Basalt and diabase of Rampart Group	Jurassic to Permian	Basalt and diabase of Rampart Group.			RB003	5140	Ruby	Ign	5140	JMab
Pg	Graywacke	Permian	Unit probably correlative with similar clastic rocks of the Permian(?) Rampart Group. Unit has three parts; a) fine- to medium-grained, medium-gray to dark-greenish-gray graywacke, calcareous in part and containing some dark-gray shale fragments, b) grit to small-pebble graywacke conglomerate with clasts of andesitic and basaltic rock, shale, chert, quartzite, and a few schistose rocks in a sand and mud matrix; and c) greenish-gray to medium-dark gray mudstone and shale.	Nodosinellids (Tetrataxis), bryozoan and echinoderm debris.		RB003	104	Ruby	Sed	5021	TrMis
MDc	Chert and argillite	Late(?) Mississippian and very latest Devonian	Medium-dark to dark-gray, thin-banded, bedded, radiolarian-bearing chert containing thin interbeds of slaty argillite. (See unit 6080 in MD quadrangle, correlated in part.). Mapped as Kca by Cass (1959)	Radiolarians		RB003	303	Ruby	Sed	6390	TrMica
Pzc	Carbonate rocks	Early Paleozoic	see unit 7520 Od in Ruby or unit 5340, Ophir quadrangle. Did not appear on final map.			RB003	5340	Ruby	Sed	5340	Pzrm
PzpCm	Metamorphic rocks	Paleozoic and preCambrian?	Not described			RB003	8600	Ruby	Sed	9325	PzZrqs
Kku	Kuskokwim Group	Middle to Late Cretaceous	Chiefly marine basin and fan deposits			LH003	1970	Lime Hills	Sed	1970	Kk
JKw	Feldspathic wacke	Jurassic or Cretaceous	Red-weathering, locally calcareous, felspathic wacke contiaining siltstone interbeds. Not on OFR98-133 as published.			LH003	2825	Lime Hills	Sed	2825	KJfm
Trb	Pillow basalt	Triassic?	Pillow basalt interbedded with minor argillite and chert. See LH004 for revised unit.	Radiolaria suggest Triassic age		LH003	4210	Lime Hills	Ign	4215	JTrtv
Mzv	Metabasalt and andesite	pre-Cretaceous	Metabasalt and metaandesite volcanic rocks			LH003	4910	Lime Hills	Meta	5220	JPzk

Rock unit	Unit hame	Age	Description	Fossil	Radiometric age	Source code	Class code	Quadrangle	Rock class	NSA class	Label
Mzu	Undifferentiated metavolcanic and metasedimentary rocks	pre-Cretaceous	Undifferentiated metavolcanic and metasedimentary rocks			LH003	4920	Lime Hills	Meta	5220	JPzk
MzPzi	Altered diabase	pre-Tertiary?	Altered diabase, andesite breccia, and aphanitic to porphyritic andesite. Age unknown, thought to be pre-Tertiary			LH003	5120	Lime Hills	Ign	5180	MzPzi
DSab	Calcareous mudstone and limestone algal reef complex	Devonian - Silurian	Calcareous mudstone and limestone algal reef complex. Shelf edge environment			LH003	6960	Lime Hills	Sed	6960	DSwc
PPl	Thick bedded limestone	Permian, Pennsylvanian?	Thick-bedded limestone, open marine shelf enviroment. Age not reported, could be Permian, Pennsylvanian? (Unit deleted in Bundtzen compilation[LH004])			LH003	5341	Lime Hills	Sed	5341	PPl
UDl	Thick bedded limestone	Late Devonian?	Thick-bedded limestone, open marine shelf enviroment. Age not reported, could be Late (Upper) Devonian?			LH003	6932	Lime Hills	Sed	6931	DSml
DSls	Laminated limestone, sandstone, and siltstone	Devonian - Silurian	Laminated limestone, micaceous sandstone, and siltstone. Slope environment.			LH003	6957	Lime Hills	Sed	6957	DSls
Sa	Argillite	Silurian	Dark-gray to black argillite with(?) chert, siltstone, and shale			LH003	6630	Lime Hills	Sed	6630	Sa
Ss	Micaceous calc-sandstone	Silurian	Micaceous calc-sandstone with minor limestone			LH003	6640	Lime Hills	Sed	6640	Ss
SOls	Argillaceous limestone, sandstone, and shale	Silurian - Ordovician	Argillaceous limestone, calc-sandstone, and graptoloitic shale. Slope to basinal deposits. Unit removed, replaced largely by unit SCpl from Bundtzen (1997)	Graptolites		LH003	6951	Lime Hills	Sed	7580	SCpl
Tbr	Big River pluton	Early Tertiary?	Medium- to coarse-grained, seriate, hypidiomorphic- granular biotite granite. Similar to and likely apothesis of Tired Pup pluton			LH002	104	Lime Hills	Ign	1320	Tpgr
Twf	Windy Fork pluton	middle Tertiary	Peralkaline granite in two distinct phases, an alkali feldspar granite and granite. Overlaps into McGrath quadrangle. Anomalous U and Th near northern margin of pluton		K-Ar biotite 29.0 to 31.1 Ma	LH002	105	Lime Hills	Ign	1270	Togr
TKg	Northern Intermediate plutons	Tertiary or Cretaceous	Biotite-amphibole granite to quartz monzonite; diorite also present.			LH002	109	Lime Hills	Ign	1655	TKg
Tmp	Merrill Pass pluton	middle Tertiary	Elongate pluton that is chiefly biotite- or biotite-hornblende granite.		K-ar biotite 35.6 to 40.0 Ma, 40/39 biotite 40.0 to 42.2 Ma	LH002	110	Lime Hills	Ign	1290	Toegr
Tmpg	Merrill Pass intermediate phases	middle Tertiary?	Highly variable intrusions spatially associated with Merrill Pass pluton. Ranges from quartz diorite to granite, northern samples typically granodiorite and granite. Larger plutonic bodies exposed in south.			LH002	113	Lime Hills	Ign	1292	Toem
Ttg	Telequana Pass pluton	middle Tertiary	Medium- to coarse-grained , seriate, biotite-hornblende granodiorite having a hypidiomorphic-granular texture. Originally mapped as part of Merrill Pass pluton, separated because of higher color index and presence of hornblende.		K-Ar discordant biotite (31.9 Ma) and hornblende (36.3 Ma), same sample.	LH002	114	Lime Hills	Ign	1292	Toem
Tsf	South Fork stocks	middle Tertiary?	Several small stocks consisting of fine- to medium-grained, seriate to subporphyritic, hypidiomorphic-granular biotite granite.			LH002	116	Lime Hills	Ign	1290	Toegr
TKm	Goldpan Peak Gabbro	Tertiary or Cretaceous	Small intrusion of fine- to medium-grained to fine- to coarse-grained, seriate, hypidiomorphic granular gabbro. Intruded by and completely surrounded by Merrill Pass pluton.			LH002	117	Lime Hills	Ign	1670	TKgb

Rock unit	Unit hame	Age	Description	Fossil	Radiometric age	Source code	Class code	Quadrangle	Rock class	NSA class	Label
Tcp	Chilligan Porphyry	Early Tertiary	Chiefly fine- to coarse-grained, biotite- or biotite-hornblende granite or granodiorite, containing alkali feldspar phenocrysts.		K-Ar biotite (60.6 Ma) and hornblende (61.3 Ma), concordant	LH002	118	Lime Hills	Ign	1320	Tpgr
Tgl	A-2 Gabbro	Early Tertiary	Dark-colored hornblende and pyroxene-hornblende fine- to medium-grained gabbro. Two varieties, one foliated (cumulate?) and a non-foliated variety.		40/39 biotite 61.4 Ma	LH002	119	Lime Hills	Ign	1380	Tgl
Tse	Unnamed pluton	Tertiary	Medium- to coarse-grained, seriate, hypidiomorphic granular quartz diorite, granodiorite, and granite.		K-Ar biotite 57.5 Ma	LH002	121	Lime Hills	Ign	1350	Thgd
TKtp	Tex Peak Mafic intrusion	Tertiary or Cretaceous	Fine-grained, eqigranular, or fine- to medium-grained seriate gabbro.			LH002	124	Lime Hills	Ign	1670	TKgb
MzPzg	Greenstone	Mesozoic or Paleozoic (Late Triassic?)	Small greenstone body consisting of dark greenish-black, massive, fine-grained equigranular greenstone. May correlate with Chilikadrotna Greenstone, which has yielded Late Triassic fossils from interbedded limestone.			LH002	125	Lime Hills	Meta	4425	Trc
TKig	Igitna granodiorite	Tertiary or Cretaceous				LH002	127	Lime Hills	Ign	1660	TKm
Ki	Unnamed stocks	Cretaceous	Fine- medium-grained, seriate to porphyritic quartz monzodiorite.		K-Ar hornblende 79.1 Ma	LH002	128	Lime Hills	Ign	2470	Kg
Tsc	Snowcap Central	middle Tertiary	Fine- to medium-grained, seriate, biotite-hornblende granite to granodiorite.		K-Ar biotite (33.5 Ma) and hornblended (35.2 Ma), concordant	LH002	130	Lime Hills	Ign	1290	Toegr
Tse	Snowcap East pluton	Tertiary	Pluton ranging from gabbro to granite incomposition, with the more mafic compositions tending to be in the southern part of the exposure.		K-Ar biotite 41.5 and 50.1 Ma, thought reset; 40/39 biotite 64.8 Ma	LH002	131	Lime Hills	Ign	1320	Tpgr
Th	Hartman Plutons	Tertiary	Series of 4 elongate plutons, individually ranging from quartz monzonite and quartz monzodiorite to granite. In general are fine- to medium-grained seriate intrusions, chiefly granodiorite.		K-Ar biotite 64.1 Ma and 40/39 biotite 65.1 Ma	LH002	132	Lime Hills	Ign	1320	Tpgr
	Jimmy Lake stock	Early Tertiary	Leucocratic biotite granite, part of McKinley sequence?		40/39 biotite 65.0 Ma	LH002	133	Lime Hills	Ign	1320	Tpgr
Tme	Mount Estelle pluton	Early Tertiary	Two phases, slightly older and finer grained northern pluton consisting of medium-grained, hypidiomorphic-granular biotite- and hornblende-bearing granodiorite containing tourmaline as a characteristic accessory mineral. It is largely esposed in the Tyonek and Talkeetna quadrangles to the north. The second phase is a slightly younger, coarser-grained southern pluton consisting of medium- to coarse-grained, seriate, hypidiomorphic-granular granodiorite. It is well exposed in the Lime Hills quadrangle and also in the Tyonek quadrangle		K-Ar biotite and hornblende ranging from 62.0 to 64.2 Ma	LH002	134	Lime Hills	Ign	1350	Thgd
TKmg	Mount Estelle Gabbro	Tertiary or Cretaceous	Very fine- to fine-grained, sub-equiganular gabbro.			LH002	135	Lime Hills	Ign	1670	TKgb
Ksp	Sled Pass pluton	Cretaceous	Elongate fine- to coarse-grained, seriate pluton consisting chiefly of monzonite and monzodiorite. Locally well-developed cataclastic foliation.		K-Ar hornblende 76.0 Ma and 40/39 biotite 70.1 Ma and hornblende 73.5 to 75.6 Ma	LH002	137	Lime Hills	Ign	2470	Kg
Tmr	Mount Rich pluton	Tertiary	Fine- to medium-grained, seriate granodiorite to tonalite. Presumably intrudes stock of McKinley sequence granite. Contains subordinate phase is fine- to medium-grained granite.		40/39 biotite 38.6 Ma	LH002	138	Lime Hills	Ign	1292	Toem

Rock unit	Unit hame	Age	Description	Fossil	Radiometric age	Source code	Class code	Quadrangle	Rock class	NSA class	Label
Tcpi	Crowded Porphyry	Tertiary	Porphyritic hypabyssal intrusive rock containing 40-50 percent phenocrysts. Phenocrysts are cheifly plagioclase feldspar and subordinate biotite and quartz. Aphanitic silicieous groundmass			LH002	139	Lime Hills	Ign	1290	Toegr
Tjc	Johnson Creek pluton	Tertiary	Chiefly fine- to medium-grained seriate to subporphyritic quartz monzodiorite; less common is a porphyritic quartz monzonite phase. Here inclides? Camp pluton		40/39 biotite 38.6 Ma	LH002	141	Lime Hills	Ign	1292	Toem
Tcc	Crystal Creek pluton	Early Tertiary	Large pluton of texturally variable, biotite +/- hornblende granite.		K-Ar biotite 60.0 to 62.0 Ma and hornblende 57.5 to 59.9 Ma. K-Ar biotite of 52.6 thought reset	LH002	142	Lime Hills	Ign	1320	Tpgr
TKkm	Unnamed quartz monzonite pluton	Tertiary or Cretaceous	Fine- to medium-grained seriate quartz monzonite.			LH002	144	Lime Hills	Ign	1655	TKg
Tsr	Stony River granodiorite	middle Tertiary	Fine- to medium-grained, seriate, hypidiomorphic granular granodiorite to quartz monzodiorite.		40/39 biotite 35.6 and 35.9 Ma	LH002	145	Lime Hills	Ign	1292	Toem
	Swift River granodiorite	earliest Tertiary or Cretaceous?	Fine- to coarse-grained, seriate, hypidiomorphic granular granodiorite. Outcrop area surrounded by Tired Pup pluton, thought to be older that Tired Pup. Is this body mapped separately?			LH002	146	Lime Hills	Ign		
TKqc	Quartz Crystal pluton	middle Tertiary?	Fine- to medium-grained, seriate, peralkaline granite to alkali feldspar granite.			LH002	147	Lime Hills	Ign	1270	Togr
Tv3	Seabee volcanic rocks	Tertiary	Predominantly crystal and crystal-lithic ash-flow tuff and lesser interbedded lava flows and local volcaniclastic sedimentary rocks.		40/39 biotite 36.5 and 41.0 Ma; 40/39 sanidene 37.6 Ma	LH002	150	Lime Hills	Ign	1070	Tvr
Tv5	A-2 volcanic rocks	Tertiary?	Chiefly crystal-lithic tuff and lesser volcaniclastic rocks, lava flows, and lahar/debris flows			LH002	153	Lime Hills	Ign	1070	Tvr
Tv4	Snowcap volcanic rocks	Tertiary	Chiefly crystal-lithic ash-flow tuff and lesser interbedded lava flows and local volcaniclastic sedimentary rocks.		40/39 hornblende 33.6 Ma	LH002	155	Lime Hills	Ign	1070	Tvr
Tv1	North volcanic center	Tertiary?	Chiefly crystal-rich ash-flow tuff and lesser lithic-crystal ash-flow tuff and lava flows. Two lahar deposits have been included in unit as well as a small hypabyssal porphyritic intrusion. Lithic fragments in tuff are graywacke and argillite derived from Kahiltna terrane.			LH002	157	Lime Hills	Ign	1070	Tvr
Tv2	Styx River Volcanics	Tertiary?	Chiefly crystal-lithic ash-flow tuff and subordinate lava flows and local volcaniclastic rocks south of Jimmy Lake Pass. Lithic fragments in tuff are chiefly volcanic and sedimentary rock fragments. Sedimentary rock fragments are graywacke and siltstone derived from Kahiltna terrane.			LH002	158	Lime Hills	Ign	1070	Tvr
JKs	Kahiltna terrane	Cretaceous and/or Jurassic	Graywacke and argillite			LH002	160	Lime Hills	Meta	2850	KJf
MzPzs	Sandstone and graywacke	Mesozoic or Paleozoic	Unit supposed to continue into Lake Clark quadrangle, however no similar unit described in Lake Clark. Unit assigned to Kakhonak Complex by default			LH002	162	Lime Hills	Meta	5220	JPzk

Rock unit	Unit hame	Age	Description	Fossil	Radiometric age	Source code	Class code	Quadrangle	Rock class	NSA class	Label
TKiu	Intrusive rocks	Tertiary or Cretaceous	Small stocks scattered throughout eastern part of Lime Hills quadrangle. Composition varies from biotite granite to hornblende-pyroxene quartz diorite. Texture varies from fine-grained equigranular to fine- to coarse-grained seriate.			LH002	170	Lime Hills	Ign	1650	TKi
Pzu	Sedimentary rocks (limey)	Paleozoic	Sedimentary rocks. Undifferentiated shale, siltstone, argillite, and limestone. Fossils, chiefly grapotlites, collected from these rocks are Late Cambrian(?), Ordovician, Silurian, and Devonian in age. Tentatively correlated with Dilinger sequence of sedimentary rocks. Unit description from LH003			LH002	190	Lime Hills	Sed	5310	DCd
TKgs	Gneiss	Tertiary or Cretaceous	Gneiss, possibly Mesozoic (Mzg)?			LH002	195	Lime Hills	Meta	1720	TKgg
Tmpb	Merrill Pass breccia	Tertiary				LH002	199	Lime Hills	Ign	1290	Toegr
Qa	Undifferentiated Quaternary surficial deposits	Quaternary				LH002	200	Lime Hills	Unconsol	100	Qs
Qal	Alluvium	Quaternary	Alluvium			LH002	202	Lime Hills	Unconsol	100	Qs
Qc	Colluvium	Quaternary	Colluvium			LH002	203	Lime Hills	Unconsol	100	Qs
Qg	Moraine?	Quaternary				LH002	204	Lime Hills	Unconsol	100	Qs
Qao	Outwash?	Quaternary				LH002	206	Lime Hills	Unconsol	100	Qs
Qr	Rock glaciers?	Quaternary	Assigned to Quat, undivided by default			LH002	207	Lime Hills	Unconsol	100	Qs
Ql	Lacustrine deposits?	Quaternary	Assigned to Quat, undivided by default			LH002	208	Lime Hills	Unconsol	100	Qs
Ttp	Tired Pup pluton	Early Tertiary	Large granite pluton, part of McKinley sequence. Chiefly medium- to coarse-grained hypidiomorphic granular biotite- or biotte-hornblende granite.		K-Ar biotite ranging from 40.1 to 59.2 Ma, most credence given to 56.7 to 59.2 Ma ages.	LH002	901	Lime Hills	Ign	1320	Tpgr
Tnep	Northeast Prong, Tired Pup pluton	middle Tertiary	Large fine- to coarse-grained seriate, biotite or biotite-amphibole granite pluton.		K-Ar biotite ranging from 25.4 to 26.7 Ma	LH002	902	Lime Hills	Ign	1270	Togr
Ttp1	Tired Pup leucogranite	Early Tertiary	Fine- to nearly coarse-grained seriate biotite granite. Gradational contact with main phase of Tired Pup pluton.			LH002	1012	Lime Hills	Ign	1320	Tpgr
TKpg	Sled Pass Gabbro	Tertiary or Cretaceous	Small dark-colored , fine- to medium-grained, seriate, hypidiomorphic-granular gabbro intrusion. Uncertain relationship with Tired Pup pluton			LH002	1121	Lime Hills	Ign	1670	TKgb
Tiu	Unnamed granitic stocks	middle Tertiary?	Fine- to medium-grained, seriate biotite-hornblende granite intruding 61 Ma gabbro.			LH002	1193	Lime Hills	Ign	1300	Tegr
Tt	Tlikakila pluton	Tertiary	Small pluton having two phases, quartz diorite and granodiorite. Quartz diorite is fine- to medium-grained, seriate. Granodiorite is fine- to medium-grained, subequigranular.		K-Ar biotite 44.6 Ma	LH002	1195	Lime Hills	Ign	1292	Toem
Tms	Unnamed McKinley sequence intrusions	Early Tertiary	Leucocratic biotite granite stocks and dike swarms			LH002	1335	Lime Hills	Ign	1320	Tpgr
Tgd	Necons River pluton	middle Tertiary	Large multiphase pluton consisting of medium- to coarse-grained, seriate, hypidiomorphic granular granite to granodiorite and lesser gabbro.		40/39 biotite 35.6 Ma	LH002	1364	Lime Hills	Ign	1290	Toegr
Tgdn	Unnamed plutons	Tertiary or Cretaceous	Gabbro to granite multi-phase bodies		K-Ar biotite on granite 64.0 Ma	LH002	1366	Lime Hills	Ign	1650	TKi
Tus	Unnamed stock	Tertiary	Small hypabyssal stock consisting of a silicic(?), biotite and hornblende-bearing porphyry.			LH002	1400	Lime Hills	Ign	1290	Toegr

Rock unit	Unit hame	Age	Description	Fossil	Radiometric age	Source code	Class code	Quadrangle	Rock class	NSA class	Label
Pzu	Sedimentary rocks (limey)	Paleozoic	Sedimentary rocks. Undifferentiated shale, siltstone, argillite, and limestone. Fossils, chiefly grapotlites, collected from these rocks are Late Cambrian(?), Ordovician, Silurian, and Devonian in age. Tentatively correlated with Dilinger sequence of sedimentary rocks.			LH003	190	Lime Hills	Sed	5310	DCd
bu	Bedrock, unknown		Unknown bedrock units			MM002	99	Mount McKinley		99	bu
Qrf	Recent flood-plain deposits	Quaternary	Recent flood-plain deposits			MM002	105	Mount McKinley	Unconsol	100	Qs
Qca	Colluvium and older alluvium	Quaternary	Colluvium and other alluvium			MM002	107	Mount McKinley	Unconsol	100	Qs
Qsm	Superglacial moraine	Quaternary	Superglacial moraine			MM002	126	Mount McKinley		100	Qs
Qrm	Recent moraine	Quaternary	Recent moraine			MM002	130	Mount McKinley		100	Qs
Qom	Older moraine	Quaternary	Older moraine			MM002	135	Mount McKinley		100	Qs
Qw	Glacial outwash deposits	Quaternary	Glacial outwash deposits			MM002	140	Mount McKinley		100	Qs
Tn	Nenana Gravel	Tertiary				MM002	570	Mount McKinley	Sed	570	Tn
Tn?	Nenana Gravel	Tertiary				MM002	571	Mount McKinley	Sed	571	Tn?
Tcs	Cantwell Formation, sedimentary rocks subunit	Tertiary				MM002	920	Mount McKinley		1920	Kcs
Tvif	Felsic subvolcanic intrusive rocks	Tertiary				MM002	1011	Mount McKinley	Ign	1011	Thf
Tvim	Mafic subvolcanic intrusive rocks	Tertiary				MM002	1012	Mount McKinley	Ign	1012	Thm
Tvg	Mount Galen Volcanics	Tertiary	See Gilbert, W.G., 1979, A geologic guide to Mount McKinley National Park: Alaska Natural History Association.		Age of 38 Ma reported	MM002	1000	Mount McKinley	Ign	1081	Tvb
Tgr	Tertiary granitic rocks	Tertiary	McGonagall pluton			MM002	1305	Mount McKinley	Ign	1292	Toem
Tgr	Tertiary granitic rocks	Tertiary	McGonagall pluton			MM002	1307	Mount McKinley	Ign	1292	Toem
Tgr	Tertiary granitic rocks	Tertiary	Eielson pluton			MM002	1308	Mount McKinley	Ign	1292	Toem
Tgr	Tertiary granitic rocks	Tertiary	Wyoming Hills pluton			MM002	1309	Mount McKinley	Ign	1292	Toem
Tgr	Tertiary granitic rocks	Tertiary	Biotite and hornblende granodiorite, Foraker pluton			MM002	1306	Mount McKinley	Ign	1292	Toem
Tgr	Tertiary granitic rocks	Tertiary	Biotite and biotite-muscovite granite, McKinley sequence, McKinley pluton			MM002	1335	Mount McKinley	Ign	1320	Tpgr
Tgr	Tertiary granitic rocks	Tertiary	Biotite and biotite-muscovite granite, McKinley sequence, Ruth pluton			MM002	1336	Mount McKinley	Ign	1320	Tpgr
TKv	Volcanic rocks	Tertiary and Cretaceous	Felsic to intermediate volcanic rocks			MM002	1607	Mount McKinley	Ign	1603	TKvr
TKgr	Granitic rocks of Tertiary and (or) Cretaceous age	Tertiary and (or) Cretaceous	Granitic rocks			MM002	1655	Mount McKinley	Ign	1655	TKg
gr	Granitic rocks of uncertain composition and age	Unknown, probable Tertiary or Cretaceous	Granitic rocks of uncertian composition and age			MM002	1599	Mount McKinley	Ign	1650	TKi
KJf	Flyschlike rocks	Jurassic or Cretaceous	Flyschlike rocks			MM002	2850	Mount McKinley	Sed	2850	KJf
Trcs	Calcareous sedimentary rocks	Triassic	Calcareous rocks			MM002	4033	Mount McKinley	Sed	4033	Trcs
Trbd	Basalt, diabase, and subordinate sedimentary rocks	Triassic	Basalt, diabase, and subordinate sedimentary rocks			MM002	4025	Mount McKinley	Ign	4423	Trn?

Rock unit	Unit hame	Age	Description	Fossil	Radiometric age	Source code	Class code	Quadrangle	Rock class	NSA class	Label
Trps	Flyschlike sedimentary rocks	Triassic and Paleozoic	Flyschlike sedimentary rocks			MM002	5040	Mount McKinley	Sed	5040	TrPas
JTrrs	Red and brown sedimentary rocks and basalt	Jurassic and Triassic	Red and brown sedimentary rocks and basalt			MM002	4060	Mount McKinley	Sed	4060	Trr
Trlb	Limestone and basalt sequence	Triassic	Limestone and basalt sequence			MM002	4021	Mount McKinley	Sed	4021	Trlb
DSl	Reefy limestone and dolomite	Devonian and Silurian	Reefy limestone and dolomite			MM002	6960	Mount McKinley	Sed	6960	DSwc
DOc	Chert and slate	Devonian and Ordovician	Chert and slate			MM002	7550	Mount McKinley	Sed	7710	Och
Pzc	Chert and phyllite	Paleozoic	Chert and phyllite			MM002	5650	Mount McKinley	Sed	5310	DCd
MDt	Totatlanika Schist	Mississippian and Devonian	Totatlanika Schist			MM002	6510	Mount McKinley	Meta	6510	MDt
Pzk	Keevy Peak Formation	Paleozoic	Keevy Peak Formation			MM002	5660	Mount McKinley	Sed	5660	Pzk
Pzsc	Spruce Creek sequence	Paleozoic	Spruce Creek sequence of Kantishna Hills from Bundtzen thesis			MM002	5666	Mount McKinley	Sed	5666	Pzsc
Pzc?	Chert and phyllite	Paleozoic	Chert and phyllite			MM002	5651	Mount McKinley	Sed	5370	JCmd
DSu	Sedimentary rocks, undifferentiated	Devonian	Undifferentiated sedimentary rocks, same as unit Dmf, Dmb, Dms of Csejtey (1992, HE002)			MM002	7290	Mount McKinley	Meta	7290	Pzsc
DSu?	Sedimentary rocks, undifferentiated	Devonian	Undifferentiated sedimentary rocks, same as unit Dmf, Dmb, Dms of Csejtey (1992, HE002)			MM002	7291	Mount McKinley	Meta	7291	Pzsc?
DOs	Sedimentary sequence	Devonian and Ordovician	Sedimentary sequence			MM002	6970	Mount McKinley	Sed	5370	JCmd
DOs?	Sedimentary sequence	Devonian and Ordovician	Sedimentary sequence			MM002	6972	Mount McKinley	Sed	5370	JCmd
DOls	Sedimentary sequence, limestone interbeds	Devonian and Ordovician	Sedimentary sequence, massive limestone interbeds			MM002	6971	Mount McKinley	Sed	6615	DSmdl
DSb	Serpentinite, basalt, chert, and gabbro	Devonian	Serpentinite, basalt, chert, and gabbro			MM002	7325	Mount McKinley	Meta	7325	Dmgs
PzpCp	Pelitic and quartzose schist sequence	Paleozoic and preCambrian?	Pelitic and quartzose schist sequence			MM002	8630	Mount McKinley	Meta	9322	PzZaqs
PzpCp?	Pelitic and quartzose schist sequence	Paleozoic and preCambrian?	Pelitic and quartzose schist sequence			MM002	8633	Mount McKinley	Meta	8633	PzZaqs
PzpCs	Sheared grit, quartzite, and quartz-mica schist	Paleozoic and preCambrian?	Sheared grit, quartzite, and quartz-mica schist			MM002	8641	Mount McKinley	Meta	8300	CZw
PzpCq	Quartzite, grit, and argillite	Paleozoic and preCambrian?	Quartzite, grit, and argillite			MM002	8640	Mount McKinley	Meta	8300	CZw
TKd	Dike swarm	Tertiary or Cretaceous	Two areas of dike swarms consisting of felsic and mafic (southern area) or felsic (northern area) dikes.			LH002	219	Lime Hills	Ign	1602	TKgp
Qs	Surficial deposits	Holocene and Pleistocene	Surficial deposits			TY002	100	Tyonek	Unconsol	100	Qs
Qs	Surficial deposits	Quaternary	Includes alluvium, talus, rock glaciers, and various morainal deposits. Bedrock outcrops are present in ravines and along cut banks of rivers			TY003	100	Tyonek	Unconsol	100	Qs
Qv	Volcanic rocks	Quaternary (with mixed Tertiary?)	Lava, breccia, and associated pyroclastics. May include Tertiary volcanic rocks			TY002	103	Tyonek	Ign	300	Qv
Tv	Volcanic rocks	Tertiary (with mixed Quaternary?)	Basaltic lava, tuff, and breccia. May include Quaternary volcanic rocks			TY002	105	Tyonek	Ign	450	QTv
Tkb	Beluga Formation	Miocene	Sandstone, siltstone, and coal			TY002	108	Tyonek	Sed	545	Tkb
Tk	Kenai Group	Tertiary	Sandstone, conglomerate, clay, and coal			TY004	163	Tyonek	Sed	560	Tk
Tkt	Tyonek Formation	Miocene and Oligocene	Sanstone, siltstone, coal, and conglomerate			TY002	106	Tyonek	Sed	600	Tty
Twf	West Foreland Formation	Eocene and Paleocene	Conglomerate, sandstone, and siltstone; mostly tuffaceous			TY002	107	Tyonek	Sed	855	Twf

Rock unit	Unit hame	Age	Description	Fossil	Radiometric age	Source code	Class code	Quadrangle	Rock class	NSA class	Label
Tv	Volcanic rocks	Tertiary	Undifferentiated volcanic mafic and felsic flows, tuff flow breccias			TY003	144	Tyonek	Ign	1000	Tvu
Tsxr	Styx River Batholith	Tertiary	Biotite granite and quartz monzonite. Weathers light brown to dark yellowish orange. Intrudes the Mount Estelle intrusive and granodiorite of the Nagshlamina River			TY003	142	Tyonek	Ign	1270	Togr
Tg	Granite and granodiorite	Late Paleocene to Early Eocene	Granite, granodiorite, diorite, and minor quartz monzonite		55 and 61 Ma	TY004	160	Tyonek	Ign	1300	Tegr
Tg	Granitic rocks	Tertiary	Granite, quartz monzonite, and syenite		K-Ar data: Five dates from Biotite: 59.0+2.4 m.y.; 58.3+1.7 m.y.; 56.5+1.6 m.y.; 57.0+1.7 m.y.; and 58.2 m.y. One date from Hornblende: 58.7+1.8 m.y.	TY002	110	Tyonek	Ign	1320	Tpgr
Tc	Chilligan River Pluton	Tertiary	Medium-grained porphyritic biotite-hornblende quartz monzonite and granodiorite. Phenocrysts of K-feldspar			TY003	145	Tyonek	Ign	1320	Tpgr
Tgd	Granodioritic rocks	Tertiary	Granodiorite and quartz diorite		K-Ar data: One date from Biotite: 60.8+1.8 m.y. One date from Hornblende: 61.9+1.8 m.y.	TY002	109	Tyonek	Ign	1350	Thgd
Tme	Mount Estelle Pluton	Tertiary	Medium grained hornblende-biotite granodiorite and quartz monzonite			TY003	140	Tyonek	Ign	1350	Thgd
Tn	Granodiorite of the Nagishlamina River	Tertiary	Medium-grained hornblende-biotite granodiorite			TY003	143	Tyonek	Ign	1350	Thgd
TKft	Felsic Tuff	Early Tertiary or Cretaceous	Crystaline tuff and lapilli tuff			TY004	164	Tyonek	Ign	1615	TKv
TKi	Unassigned intrusive rock	Cretaceous or Tertiary	Undifferentiated felsic and mafic intrusive rocks			TY003	139	Tyonek	Ign	1650	TKi
TKi1	Unassigned intrusive rocks	Cretaceous or Tertiary	Chiefly granite and quartz monzonite. Rocks east of Skwenta River and south of Merrill Pass may be equivalent to Styx River batholith			TY003	141	Tyonek	Ign	1655	TKg
TKgd	Granodioritic rocks	Tertiary and Cretaceous	Granodiorite, quartz diorite, and diorite		K-Ar data: Three dates from Biotite: 62.9+1.8 m.y.; 70.9 m.y.; 62.6+1.8 m.y. Four dates from Hornblende: 72.0 m.y.; 68.6+2.1 m.y.; 72.1 m.y.; 64.8+1.9 m.y.	TY002	113	Tyonek	Ign	1660	TKm
Ks		Early and Late Cretaceous	Sandstone, siltstone, conglomerate, cherty argillite, and limestone			TY004	161	Tyonek	Sed	1800	Ksu
Kb	Cretaceous basalt	Cretaceous	Dark green and gray aphanitic basalt with local pillow forms			TY004	162	Tyonek	Ign	2230	Kve
Kg	Granitic rocks	Cretaceous	Quartz monzonite and syenite		K-Ar data: One date from Hornblende: 107+3.2 m.y.	TY002	116	Tyonek	Ign	2530	Kg
Kw	Metasedimentary rocks	Cretaceous (?)	Feldspathic wacke with interbeds of siltstone. Locally calcareous. Weathers reddish brown			TY003	135	Tyonek	Meta	2825	KJfm
KJu	Metasedimentary rocks (undivided)	Cretaceous and (or) Jurassic	Weakly metamorphosed slate and graywacke; locally includes volcanic and intrusive rocks, undivided			TY002	115	Tyonek	Sed	2850	KJf

Rock unit	Unit hame	Age	Description	Fossil	Radiometric age	Source code	Class code	Quadrangle	Rock class	NSA class	Label
Km	Metasedimentary rocks	Cretaceous (?)	Undifferentiated metasedimentary rocks. Slate, graywacke, siltstone, argillite and phyllite, andalusite schist near contact with Hartman River intrusives. Medium to dark gray. Locally red weathering feldspathic wacke (Kw)			TY003	136	Tyonek	Meta	2850	KJf
Jtk	Talkeetna Formation	Early Jurassic	Volcanic breccia, tuff, agglomerate, and aphanitic lava flows; as mapped, locally includes Kamishak Formation in Ilianna Quad			TY002	151	Tyonek	Ign	3250	JTrtk
Mzv	Metavolcanic and Metasedimentary rocks	Mesozoic	Predominantly metavolcanic rocks of pre-Cretaceous age. Chiefly metabasalts and metaandesites. May be equivalent to the Talkeetna Formation. Locally includes subordinate metasedimentary rocks			TY003	151	Tyonek	Meta	3250	JTrtk
Trk	Kamishak Formation	Late Triassic	Limestone, grey to black chert, and porcellanite			TY002	4020	Tyonek	Sed	4020	Trk
Trl	Limestone and fine-grained tuff	Late Triassic	Limestone and fine-grained tuff			TY002	4025	Tyonek	Sed	4025	Trlst
Trc	Chert and some greenstone	Late Triassic	Chert and some greenstone			TY002	4035	Tyonek	Sed	4035	Trcg
Mzi	Unassigned intrusive rocks	Mesozoic	Chiefly sphene-bearing quartz diorite and diorite			TY003	154	Tyonek	Ign	4800	Mzi
Mzm	Unassigned mafic rocks	Mesozoic	Chiefly diorite and olivine and/or hornblende gabbro. Occurs as inclusions in Tertiary intrusive rocks. Locally may be metamorphosed equivalent of unit Mzi			TY003	153	Tyonek	Ign	4880	Mzm
Mzs	Metavolcanic and Metasedimentary rocks	Mesozoic	Predominently metasedimentary rocks of pre-Cretaceous age. Locally includes subordinate metavolcanic rocks. Locally includes metasedimentary rocks (Km) of Cretaceous age			TY003	152	Tyonek	Meta	4905	JPzk
Mzu	Metavolcanic and Metasedimentary rocks	Mesozoic	Undifferentiated metavolcanic and metasedimentary rocks of pre-Cretaceous age. Locally may include metasedimentary rocks (Km) of Cretaceous age			TY003	150	Tyonek	Meta	4920	JPzk
Q	Surficial materials, undivided	Quaternary	Includes stream alluvium, colluvial deposits, terrace gravel, eolian deposits, and glacial deposits			TN003	100	Tanana	Unconsol	100	Qs
Ts	Sedimentary rocks, undivided	Tertiary, Eocene	Interbedded polymictic pebble-cobble-boulder conglomerate, grit, and sandstone, with siltstone, shale, and lignite.			TN003	640	Tanana	Sed	640	Tcb
Tv	Volcanic rocks, undivided	Paleocene to Eocene	Bimodal assemblage of rhyolite and banded rhyolite flow rocks, rhyolitic breccia, tuffaceous sedimentary rocks, and amygdaloidal basalt flow rocks.			TN003	1001	Tanana	Ign	1001	Trs
TKv	Volcanic rocks	Late Cretaceous to Early Tertiary	See unit TKV, TN002			TN003	1604	Tanana	Ign	1604	TKvd
TKg	Granitic rocks, undivided	Late Cretaceous to Early Tertiary	Light- to vey light-gray quartz monzonite, may range to granite.		K-Ar(?) 61.8 Ma	TN003	1655	Tanana	Ign	1655	TKg
Kwc	Wilber Creek unit of Weber and others (1992)	Early Cretaceous	Interlayered siltstone, shale, snadstone, and conglomerate. Impure graywacke rich in volcanic detritus is locally characteristic and probably correlates with the Kathul Graywacke of the Charley River quadrangle.			TN003	2115	Tanana	Sed	2115	Kwcf
Kg	Granitic rocks, undivided	Cretaceous?	Ray Mountains pluton and part of another large pluton at north central edge of quadrangle. Quartz monzonite, granite, monzonite, and possibly granodiorite.			TN003	2470	Tanana	Ign	2410	Kg
Kg	Granitic rocks, undivided	Cretaceous?	Part of Melozitna pluton. Quartz monzonite, granite, monzonite, and possibly granodiorite.			TN003	2471	Tanana	Ign	2530	Kg

Rock unit	Unit hame	Age	Description	Fossil	Radiometric age	Source code	Class code	Quadrangle	Rock class	NSA class	Label
TKg	Granitic rocks	Cretaceous or Tertiary	Granitic rocks of uncertain composition, texture, and age; may be equivalent to KG unit of Melozitna quadrangle (MZ002)			TN003	2480	Tanana	Ign	2460	Kg
KJw	Wolverine quartzite unit of Weber and others (1992), undivided	Early Cretaceous and or Jurassic	Light-gray quartzite and dark-gray, cleaved, subphyllitic argillite and shale, part of unit KJcs of Chapman and others.			TN003	2815	Tanana	Sed	2815	KJw
KJwq	Wolverine quartzite unit of Weber and others (1992), quartzite	Early Cretaceous and or Jurassic	Light-gray to tan, white weathering, massive-bedded, moderately well-sorted, subrounded fine- to medium-grained quartzarenite. Correlative with Keenan Quartzite of Charley River quadrangle according to Dover but I wonder if this is the wrong unit and it should be the Wilber Creek quartzite correlated. (Not on published OFR98-133)			TN003	2816	Tanana	Sed	2816	KJw
KJwa	Wolverine quartzite unit of Weber and others (1992), sandstone and shale	Early Cretaceous and or Jurassic	Dominantly gray o black argillaceous rocks containing interbeds of Wolverine-type quartzarenite.			TN003	2817	Tanana	Sed	2817	KJw
Jsc	Serpentinite and or carbonatite	Jurassic?	Serpentinite, diabase-gabbro and some metadiorite and magnetite-rich			TN003	3495	Tanana	Ign	5190	MzZum
JMr	Rampart Group and associated mafic intrusive rocks, undivided	Mississippian to Jurassic	Rampart Group volcanic and sedimentary rock sequence			TN003	5020	Tanana	Ign	5020	TrMts
JMbc	Basalt and chert	Mississippian to Jurassic?	Dominantly basalt, altered basalt, and subordinate diabase and a low-grade cataclastic assemblage of generally dark gray chert and silicieous argillite. Also subordinate volcaniclastic rocks and minor Mississippian limestone			TN003	5140	Tanana	Ign	5140	JMab
Pzm	Mafic rocks	Paleozoic?	Metamorphosed mafic igneous rocks, ranging from metagabbro and metadiabase to greenstone, amphibolite, and garnet amphibolite. (Shown on source map compilation as unit Pzg)			TN003	5141	Tanana	Meta	5285	Pzrmi
JMu	Mafic and ultramafic rocks, undivided	Jurassic?	Massive and layered gabbro, leucogabbro, harzburgite, garnet amphibolite, serpentinized peridotite, and dunite			TN003	5150	Tanana	Ign	5150	Jaum
Pzsr	Schist of Ruby and Garnet Creeks area	Paleozoic?	Polymetamorphic staurolite-garnet-schist containing subordinate quartzite, and hornblede amphibolite			TN003	5208	Tanana	Meta	5208	TPza
Pzl	Metalimestone and marble	Paleozoic?	Metalimestone and marble			TN003	5525	Tanana	Meta	5525	Dm
TrPs	Sedimentary rocks, undivided	Permian to Triassic	Dominantly dark-gray, typically phyllitic, silicieous to carbonaceous argillite and shale, having subordinate but characteristic clast-supported chert-rich conglomerate, greenish-gray chert, tuffaceous volcaniclastic rocks, yellowish- to reddish-brown highly calcareous argillite or limestone, and minor mafic intrusive rocks. May include older (Devonian? or Mississippian?) or younger (Cretaceous) rocks locally.			TN003	5740	Tanana	Sed	5012	TrPs
Ml	Limestone	Mississippian	Gray, bioclastic limestone, found in structurally isolated thrust slice Not on OFR98-133			TN003	6330	Tanana	Sed	6944	DSl

Rock unit	Unit hame	Age	Description	Fossil	Radiometric age	Source code	Class code	Quadrangle	Rock class	NSA class	Label
Dao	Augen orthogneiss	Devonian	Augen most commonly of white potassium feldspar, range in size from 1 to 10 cm long, most about 4 cm long. Biotite is scarce to abundant. Foliation layers containing biotite bend around augen.			TN003	6520	Tanana	Meta	6522	MDrao
Mq	Globe quartzite	Mississippian	Vitreous quartzite associated with gabbro sills and dikes. Light-gray quartzite. Massive or thinly interbedded quartzite and medium- to dark-gray slate, phyllite, and minor laminated claystone. Age from date of Trm intrusive and lithologic and stratigraphic similarities to Keno Hill Quartzite in Yukon.			TN003	6530	Tanana	Meta	6530	Mgq
pCa	Amy Creek unit of Weber and others (1992)	Late Proterozoic? to early Cambrian?, Devonian?	White, massive, locally laminated, unfossiliferous cherty dolostone characterized by replacement silica boxwork locally and gray limestone at top and bottom of section. Possible other correlations suggest this unit is equivalent to unit Dld of this quadrangle and age of Devonian, which would simply some regional stratigraphic and structural issues.			TN003	6680	Tanana	Sed	6680	SZa
Dld	Limestone and dolomite	Latest Devonian (Famennian)	Light- to medium-gray or tan marker units of sandy, platy limestone and massive-bedded silicified limestone and dolostone having extensive locally developed boxwork silica. Not on OFR98-133	Platy limestone and a limestone bed thought to be part of the section contains sparse conodonts of Famennian age.		TN003	6905	Tanana	Sed	6944	DSl
Dlr	Limestone of Raven Ridge	Late Devonian?	Gray micritic limestone and brecciated limestone.	Undescribed megafossils		TN003	6931	Tanana	Sed	6944	DSl
Pzmr	Marble	Paleozoic?	Distinctive marker bed of coarsely recrystallized marble within Pzsr unit			TN003	6955	Tanana	Meta	6955	Dlc
Ofc	Fossil Creek Volcanic unit of Weber and others (1992)	Ordovician	Agglomeratic mafic volcanic rocks, volcaniclastic rocks, and assoiciated argillaceous sedimentary rocks			TN003	7610	Tanana	Ign	7610	Ofc
Pzlc	Livengood Dome Chert?	Ordovician	Heterogeneous, low-grade, blastomylonitic assemblage of silicieous to cherty argillite, recrystallized chert, intermediate to mafic volcaniclastic rocks and greenstone, graywacke, grit, and oolitic limestone. Resembles lower grade parts of unit Pzs in this quadrangle.			TN003	7712	Tanana	Meta	7710	Och
Pzll	Limestone	Paleozoic?	Distinctive marker bed of lime mudstone, locally characterized by coated ooids; is part of Livengood Dome Chert			TN003	7711	Tanana	Sed	7711	Oldl
pCw	Wickersham unit of Weberr and others (1992), undivided	Cambrian and or Late Proterozoic	Poorly sorted quartzite and grit, having abundant quartz and plagioclase clasts in a quartzofeldspathic-wacke matrix.			TN003	8410	Tanana	Meta	8300	CZw
Pzs	Schist	Paleozoic?	Low to moderately high-grade, blastomylonitic, polymetamorphic assemblage of pelitic to quartzitic schist containing subordinate layers of quartzo-feldspathic schist, calc-schist, calc-sliciate gneiss, amphibolitic schist, quartzite, marble, and metaconglomerate. (Shown on source map compilation as Pzqs)			TN003	8630	Tanana	Meta	9325	PzZrqs
Pzq	Quartzite	Paleozoic?	Relatively pure quartzite units locally mappable and typically associated with mafic rocks (unit Pzm) and metalimestone and marble (unit Pzl). (Shown on source map compilation as uncolored Pzqs)			TN003	8640	Tanana	Meta	9325	PzZrqs

Rock unit	Unit hame	Age	Description	Fossil	Radiometric age	Source code	Class code	Quadrangle	Rock class	NSA class	Label
PzpCqg?	Quartzofeldspathic orthogneiss	Late Proterozoic? and or Paleozoic?	Quartzofeldspathic orthogneiss, located only on west side of Ray Mountains pluton.			TN003	8800	Tanana	Meta	8801	PzZrpg
Olc	Livengood Dome Chert	Ordovician	Separate from Pzlc which was described as: Heterogeneous, low-grade, blastomylonitic assemblage of silicieous to cherty argillite, recrystallized chert, intermediate to mafic volcaniclastic rocks and greenstone, graywacke, grit, and oolitic limestone. Resembles lower grade parts of unit Pzs in this quadrangle. No new description provided for this, see Livengood, unit Old)			TN003	7710	Tanana	Meta	7710	Och
TKhf	Hornfels and skarn	Cretaceous and Paleocene	Brown to gray, massive to locally porphyroblastic, garnet-chlorite-biotite hornfels derived from carbonate and clastic rocks. Assigned to unit of provenence			MG002	none	McGrath	Meta		
Qg	Active Glaciers	Pleistocene and Holocene	Occupy cirques with base level above 4,800 to 6,100 ft elevation			MG002	101	McGrath	Unconsol	101	g
Qa	Stream Alluvium, undifferentiated	Holocene	Fluvial silt, sand, and gravel deposited by streams in floodplains, fans, and meandering to distributary stream channel deposits			MG002	100	McGrath	Unconsol	100	Qs
Qat	Terrace Alluvium	Wisconsin to early Holocene	Moderately to well sorted, well stratified, gray to tan (oxidized), fluvial silt, sand, and gravel of varying ages deposited on former floodplains that now lie above or beyond the normal depositional regime of Holocene streams.			MG002	110	McGrath	Unconsol	100	Qs
Qaf	Alluvial-fan deposits	Late Wisconsin to Holocene	Poorly to moderately well sorted, gray to tan (oxidized), fluvial silt, sand, and gravel deposited where first- and second-order tributaries join third- and fourth-order streams			MG002	105	McGrath	Unconsol	100	Qs
Qca	Colluvial-alluvial deposits	Holocene	Mixed or alternating, poorly to moderately sorted, silt, sand, gravel, and diamicton of colluvial and alluvial origins			MG002	115	McGrath	Unconsol	100	Qs
Qct	Talus	Holocene	Angular, unsorted debris derived from frost riving of bedrock followed by rapid gravity transport on steep slopes, cirque headwalls, steep gullies, and avalanche chutes			MG002	120	McGrath	Unconsol	100	Qs
Qcl	Landslide deposits	Holocene	Chaotically deformed colluvium derived from relatively sudden mass movement of bedrock or surficial deposits along a plane of failure. Hummocky and usually frozen			MG002	125	McGrath	Unconsol	100	Qs
Qe	Eolian deposits	Holocene	Well-sorted sand and silt transported and deposited by wind. Usually frozen			MG002	135	McGrath	Unconsol	100	Qs
Qsp	Silt and Peat	Late Wisconsin to Holocene	Poorly stratified, black to brown, organic rich, alluvial, eluvial, lacustrine, and bog silt and peat. Usually frozen, except near stream cuts			MG002	130	McGrath	Unconsol	100	Qs
Qdic	Ice-contact deposits	Wisconsin and early Holocene	Stratified gravel, sand, and flowtill deposited on, against, or under stagnant masses of glacial ice by meltwater streams			MG002	165	McGrath	Unconsol	100	Qs
Qdt	Till, undifferentiated	Late Wisconsin and Holocene	Unsorted to poorly sorted clay, silt, sand, and gravel deposited by glacial ice			MG002	170	McGrath	Unconsol	100	Qs
Qrg	Rock Glaciers and Rock-Glacier deposits	Holocene	Unsorted, angular, frost-shattered cobbles and boulders, commonly containing considerable intersticial ice. Usually frozen.			MG002	145	McGrath	Unconsol	100	Qs

Rock unit	Unit hame	Age	Description	Fossil	Radiometric age	Source code	Class code	Quadrangle	Rock class	NSA class	Label
Qdtf	Till of Farewell Glaciation	Wisconsin	Unsorted to poorly sorted clay, silt, gravel, and boulders deposited by glacial ice as ground, terminal, and lateral moraines. Mostly the result of Farewell I and Farewell II glaciations			MG002	175	McGrath	Unconsol	100	Qs
Qdo	Outwash	Wisconsin	Stratified drift consisting of coarse subrounded gravel that contains sand and silt lenses deposited by sideglacial and proglacial meltwater streams. Usually frozen			MG002	155	McGrath	Unconsol	100	Qs
Qdot	Outwash Terrace	Early to middle Pleistocene	Remnant of former outwash fan or plain deposit (Qof)			MG002	160	McGrath	Unconsol	100	Qs
Qdts	Till of Selatna GLaciation	Pleistocene	Unsorted to poorly sorted clay, silt, and gravel deposited by glacial ice in ground moraines			MG002	180	McGrath	Unconsol	100	Qs
Qdtlm	Till of Lone Mountain Glaciation	Early or middle (?) Pleistocene	Isolated patches of unsorted to poorly sorted silt, gravel, and highly eroded erratics deposited by glacial ice			MG002	185	McGrath	Unconsol	100	Qs
Qof	Outwash-fan deposits	Middle Pleistocene to early Wisconsin	Glaciofluvial sand and silt derived from streams originating near ancestral glacial margins. Usually frozen			MG002	150	McGrath	Unconsol	100	Qs
Qdtplm	Till of Pre-Lone Mountain Glaciation	Pliocene and Pleistocene	Isolated patches of unconsolidated to weakly cemented, diamicton largely recemented by calcite-forming tillite. May correlate with deformed till and outwash (QTg)			MG002	190	McGrath	Unconsol	100	Qs
QTg	Consolidated Till and Outwash	Pliocene and Pleistocene	Weakly to well cemented diamicton, interbedded with crudely stratified outwash, with local and exotic lithologies			MG002	195	McGrath	Sed	100	Qs
Thf	Hornfels and skarn	Paleocene to Oligocene	Brown to gray, massive to locally porphyroblastic, garnet-chlorite-biotite hornfels derived from carbonate and clastic rocks. Assigned to unit of provenence			MG002	none	McGrath	Meta		
Tcf	Felsite Conglomerate	Oligocene and Miocene	Thick-bedded, poorly indurated, orange-weathered, light brown granule, cobble conglomerate with clasts of felsic igneous rocks.			MG002	200	McGrath	Sed	500	Tsu
Tcg	Coal-bearing sandstone, shale, and conglomerate	Late Paleocene (?) to Oligocene	Thin- to thick-bedded, poorly to moderately indurated, buff-weathered, gray-brown, granule to cobble conglomerate, minor sandstone, and interbedded dark gray carbonaceous shale and coal. Correlated with Ts			MG002	205	McGrath	Sed	640	Tcb
Ts	Sandstone and shale	pre-Middle Eocene	Thin- to thick-bedded, moderately indurated, red-brown weathered, buff, medium-grained, lithoquartzose sandstone interbedded with poorly indurated, laminated, fissile, carbonaceous shale and fine sandstone. Correlated with Tcg			MG002	210	McGrath	Sed	500	Tsu
Tcl	Limestone conglomerate	Late Paleocene (?) to Oligocene	Thick- to thin-bedded, moderately indurated, green-gray granule conglomerate exposed in fault sliver near Khuchaynik Creek. Although it is compositionally distinct, it crops out near Ts and Tcg, and is correlated with them			MG002	215	McGrath	Sed	500	Tsu
Tvs	Volcaniclastic sandstone and lacustrine silt	Eocene	Brown to gray, medium- to fine-grained volcaniclastic sandstone that has a distinctive 50 ft thick section of flora-rich paleosols and finely laminated, varved shales of probable lacustrine origin aqsscoiated with the Ship Creek, Windy Fork, and Terra Cotta Volcanic Fields	Metasequoia cuneata and Glyptostrobus europaeus (plant fossils)		MG002	220	McGrath	Sed	880	Tfv

Rock unit	Unit hame	Age	Description	Fossil	Radiometric age	Source code	Class code	Quadrangle	Rock class	NSA class	Label
Tva	Andesite flows and lapilli tuff	Paleocene and Eocene	Dark-gray to green-gray andesite flows and locally banded (red, green, purple, bleached) lapilli tuff. Groundmass is aphanitic to fine-grained of Ship Creek, Windy Fork, and Terra Cotta Volcanic Fields		Whole-rock K/Ar age of 37.1 Ma from Windy Fork volcanic field	MG002	230	McGrath	Ign	1081	Tvb
Tvvd	Vent facies dacite	Eocene and Oligocene	Very distinctive, light gray, distinctively tan weathering, hornblende and potassium-feldspar-rich, propylitically altered dacite containing very abundant angular clasts of sedimentary rocks of Ship Creek, Windy Fork, and Terra Cotta Volcanic Fields;			MG002	245	McGrath	Ign	1081	Tvb
Tvlr	Lapilli rhyodacite	Eocene and Oligocene	Light- to medium-gray, porphyro-aphanitic, potassium-feldspar-rich rhyodacite flows containing conspicuous layers of purple, green, and red lapilli tuff beds. Ship Creek, Windy Fork, and Terra Cotta Volcanic Fields			MG002	255	McGrath	Ign	1081	Tvb
Tvgt	Green tuff	Oligocene	Distinctly mid- to dark-green, fine to medium grained ash flow (?) tuff containing very minor blocks of darker green, altered agglomerate composed of rounded clasts. Marker bed for Terra Cotta volcanic field. Ship Creek, Windy Fork, and Terra Cotta Volcanic Fields;			MG002	260	McGrath	Ign	1081	Tvb
Tvl	Lahar deposits	Eocene	Medium- to dark-green-gray, very coarse grained lahar deposit. Ship Creek, Windy Fork, and Terra Cotta Volcanic Fields			MG002	265	McGrath	Ign	1081	Tvb
Tvf	Felsic tuff and flows	Eocene and Oligocene	Bleached to light-gray, locally banded, hypocrystalline rhyolite tuff and flows. Ship Creek, Windy Fork, and Terra Cotta Volcanic Fields			MG002	270	McGrath	Ign	1081	Tvb
Tvm	Basalt and basaltic andesite	Paleocene and Eocene	Dark gray to maroon, locally porphyritic, columnar jointed, olivine bearing, augite basalt and basaltic andesite flows. Ship Creek, Windy Fork, and Terra Cotta Volcanic Fields;		Four K/Ar ages ranging from 41.3 Ma to 48.9 Ma from the Ship Creek volcanic field	MG002	275	McGrath	Ign	1081	Tvb
Tid	Undifferentiated sills and dikes	Eocene to Miocene	Undifferentiated sills and dikes of mafic and felsic composition			MG002	435	McGrath	Ign	1010	Thf
Tia	Andesite-trachyandesite sills and dikes	Eocene to Miocene	Green-gray, fine-grained, hypidiomorphic-granular, porphyritic andesite dikes less than 65 ft thick. Local variety-granodiorite		Five K/Ar ages from 20.9 to 39.3 Ma	MG002	420	McGrath	Ign	1011	Thf
Tif	Felsic sills and dikes	Eocene to Miocene	Felsic (light pinkish tan to white), aphanitic to fne-grained, dikes and sills up to 16 ft thick			MG002	425	McGrath		1011	Thf
Tim	Mafic sills and dikes	Paleocene and Eocene	Mafic (dark brown), pandiomorphic-granular, sills and dikes up to 34 ft thick. Locally porphyritic basalt, gabbro, and diabase		K/Ar mineral ages ranging from 45.5 to 55.0 Ma	MG002	430	McGrath	Ign	1012	Thm
Tvld	Lapilli tuff	Eocene and Oligocene	Light gray to bleached white with yellowish staining, locally banded (purple, white), lapilli dacite and tuff of Ship Creek, Windy Fork, and Terra Cotta Volcanic Fields			MG002	240	McGrath	Ign	1081	Tvb
Tvd	Massive dacite	Oligocene	Light- to medium-gray, porphyro-aphanitic, hornblende-bearing massive dacite of Terra Cotta volcanic field of Ship Creek, Windy Fork, and Terra Cotta Volcanic Fields		Whole-rock Ar/Ar age of 31.3 from Terra Cotta volcanic field	MG002	235	McGrath	Ign	1081	Tvb
Tvt	Intermediate to felsic air-fall tuff	Eocene	Composite unit of light- to medium-green-gray, well laminated medium to very coarse grained, crystal-rich, air-fall tuff of Ship Creek, Windy Fork, and Terra Cotta Volcanic Fields	Petrified wood, dicotyledon, and Metasequoia		MG002	225	McGrath	Ign	1081	Tvb

Rock unit	Unit hame	Age	Description	Fossil	Radiometric age	Source code	Class code	Quadrangle	Rock class	NSA class	Label
Tvab	Andesite breccia	Eocene	Medium-gray, purple-hued weathering, porphyritic, pyroxene andesite containing distinctive zones of pyroclastic breccia consisting of in situ andesite fragments. Groundmass is aphanitic to interstitcial. Ship Creek, Windy Fork, and Terra Cotta Volcanic Fields		Ar/Ar age of 41.1 Ma from hornblende of Terra Cotta volcanic field	MG002	250	McGrath	Ign	1081	Tvb
Twg	Windy Fork granite	Oligocene	White to pink and locally blue-gray, medium- to coarse-grained, peralkaline arfvedsonite granite of Windy Fork pluton		K/Ar ages of 23.4 Ma from pyroxene, 30.1 Ma from biotite, and 29.0 Ma from hornblende	MG002	445	McGrath	Ign	1270	Togr
Tgd	Hartman pluton granodiorite	Eocene	Medium- to coarse-grained, equigranular, hornblende-biotite granodiorite with a strong hornfels aureole. (Not equivalent in age to Hartman plutons of Lime Hilles quadrangle.)		K/Ar age of 37.9 Ma from biotite	MG002	450	McGrath	Ign	1300	Tegr
Tqm	Quartz monzonite, monzonite breccia, and quartz porphyry	Paleocene and Eocene	Composite unit of light gray, fine- to medium-grained hypidiomorphic to equigranular, biotite quartz monzonite, aegirine-rich monzonite, and altered biotite quartz porphyry		Nine K/Ar ages range from 51.1 to 61.8 Ma	MG002	455	McGrath	Ign	1307	Tgdp
Tgr	South Fork granite	Paleocene and Eocene	Light gray, pink, medium- to coarse-grained, equigranular, biotite (muscovite) granite		K/Ar age of 58.8 Ma from biotite	MG002	460	McGrath	Ign	1320	Tpgr
Tgqm	Middle Fork Plutonic Complex; granite, quartz monzonite, and monzodiorite	Paleocene and Eocene	Fine- to medium-grained, biotite- and hornblende-bearing plutonic rocks with variable quartz contents and feldspar ratios		Three K/Ar mineral ages of 56.1, 56.6, and 57.2 Ma from quartz monzonite. Two K/Ar ages of 57.7 and 55.6 Ma	MG002	470	McGrath	Ign	1320	Tpgr
Tgsy	Middle Fork Plutonic Complex; granite to quartz syenite	Paleocene and Eocene	Fine- to medium-grained, granite to quartz syenite			MG002	480	McGrath	Ign	1320	Tpgr
Tsy	Middle Fork Plutonic Complex; syenite	Paleocene and Eocene	Green-gray, white-gray weathering, medium- to coarse-grained, olivine-clinopyroxene syenite. Locally iron stained			MG002	485	McGrath	Ign	1320	Tpgr
TKqm	Mount Estelle granodiorite	Cretaceous and Paleocene	Fresh, medium-gray, medium-grained, equigranular, hornblende-biotite granodiorite.		Ar/Ar age of 79.0 Ma from biotite	MG002	490	McGrath	Ign	1350	Thgd
Tgb	Middle Fork Plutonic Complex; alkali gabbro	Paleocene and Eocene	Dark green-brown, fine- to medium-grained, biotite-olivine-pyroxene gabbro			MG002	475	McGrath	Ign	1380	Tgl
TKvt	Air-fall tuff of intermediate composition	Cretaceous and Paleocene	Light- to medium-green-gray, well-laminated, crystal tuff. Veleska Lake Volcanic Field	'rich in undated plant fossils'		MG002	295	McGrath	Ign	1600	TKv
TKm	Gabbro-granodiorite	Cretaceous	Heterogeneous dike swarms consisting of augite gabbro, hornblende granodiorite, and monzodiorite		K/Ar ages of 69.7 Ma from biotite and 79.0 Ma from hornblende	MG002	495	McGrath	Ign	1601	TKd
TKvf	Rhyolite tuff	Cretaceous and Paleocene	White- to light-gray, locally banded, hypocrystalline rhyolite. Veleska Lake Volcanic Field			MG002	285	McGrath	Ign	1603	TKvr
TKvd	Dacite flows and dikes	Cretaceous and Paleocene	Light- to medium-gray, aphanitic to porphyro-aphanitic, chloritized hornblende dacite flows. Veleska Lake Volcanic Field		K/Ar age of 65.8 Ma	MG002	280	McGrath	Ign	1604	TKvd
TKvm	Basalt andesite	Cretaceous and Paleocene	Medium-gray-green, fine-grained, augite-rich basaltic andesite and minor andesite flow breccia. Veleska Lake Volcanic Field			MG002	290	McGrath	Ign	1605	TKvi

Rock unit	Unit hame	Age	Description	Fossil	Radiometric age	Source code	Class code	Quadrangle	Rock class	NSA class	Label
KJsh	Flyschoid sandstone and shale	Jurassic and Cretaceous	Medium- to very dark-gray, fine-grained, lithic sandstone, siltstone, and shale. Kahiltna Terrane	Inoceramus murgalensis and Inoceramus peltiformis pochialaynen (Early Cretaceous)		MG002	300	McGrath	Sed	2850	KJf
KJs	Coarse sandstone and minor siltstone	Jurassic and Cretaceous	Medium-gray to distinctly tan-weathered, lithic sandstone containing clasts of volcanic rocks, sandstone and shale, granitic rocks, quartz, and lime-rich sediments. Flute clasts and ripple marks common. Kahiltna Terrane	Early Cretaceous pelecypods		MG002	305	McGrath	Sed	2850	KJf
KJc	Pebble to boulder conglomerate and minor sandstone	Jurassic and Cretaceous	Light-gray, tan weathered, pebble to boulder conglomerate. Kahiltna Terrane	Inoceramus murgalensis (Early Cretaceous)		MG002	310	McGrath	Sed	2850	KJf
KJg	Gabbro and diorite	Jurassic and Cretaceous	Buff-weathered, dark green-gray gabbro and diorite. Unit may be equivalent to Jurassic-Cretaceous gabbro-diorite swarm that intrudes along a major suture separating the Pingston Terrane from the Yukon-Tanana terrane in Denali National Park			MG002	505	McGrath	Ign	2920	Jmu
KJm	Slate and metasiltstone	Jurassic and Cretaceous	Very thin-bedded, fissile, rusty-brown-weathered, black slate, metasiltstone, micaceous metasandstone, and rare silty limestone turbidite. McKinley Terrane	Mesozoic radiolaria and megafossils from Talkeetna quad		MG002	315	McGrath	Meta	2852	KJfn
lJs	Tatina River Volcanics; phosphatic shale and green volcaniclastic sandstone	Jurassic	Medium- to very-dark-gray, distinctly bleached bluish-white, phosphatic shale; green, medium grained, concretion-rich, volcaniclastic sandstone; and minor tan chert-cobble pebble conglomerate. Farewell Composite Terrane	Entolium sp. and Eopecten (?) sp. of Jurassic age		MG002	335	McGrath	Sed	3210	JTrtv
Trls	Limestone and shale	Triassic	Thin-bedded, medium gray quartzitic limestone; gray, silty limestone, and shale. Basal beds mainly fine-grained, gray sandstone and siltstone and subordinate cherty limestone. Pingston Terrane	Monotis sp. (Late Triassic) pelecypod		MG002	320	McGrath	Sed	4033	Trcs
Trs	Tatina River Volcanics; shale, coarse volcaniclastic sandstone, and chert	Triassic	Tan to greenish-gray, buff to orange weathered, pebble rich, immature conglomerate, coarse volcaniclastic sandstone, distinctly brown silty shale, and light gray, green, and black chert. Farewell Composite Terrane	Monotis subcircularis and Halobia cf. fallax late-Early-to-early Late Norian of the Late Triassic		MG002	345	McGrath	Sed	4050	Trcg
Trab	Tatina River Volcanics; pillow basalt and gabbro	Triassic	Dark green-gray, massive, aphanitic to medium-grained, olivine-clinopyroxene rich, pillow basalt, olivine diabase and gabbro sills, and mafic agglomerate. Locally well developed pillow structure. Farewell Composite Terrane			MG002	340	McGrath	Ign	4215	JTrtv
Trum	Ultramafic to diorite sills	Late Triassic	Dark green-gray, fine- to coarse-grained, ultramafic sills, olivine gabbro, and diorite, 50 to 66 ft thick			MG002	510	McGrath	Ign	4320	Trgb
MzPzi	Gabbro and diorite sills and dikes	Early Paleozoic	Brownish weathered, dark green-gray, very fine- to medium-grained phaneritic, locally micropegmatoidal, olivine, aegirine-augite, gabbro, diorite, and uncommonly alkali syenite			MG002	515	McGrath	Ign	5180	MzPzi
uPzs	Volcanogenic phyllite	Permian	Dark gray-green to distinctly maroon, pyrite-rich volcanogenic phyllite cut by thin quartz-carbonate veins. Yukon-Tanana Terrane			MG002	325	McGrath	Ign	5545	PMpc

Rock unit	Unit hame	Age	Description	Fossil	Radiometric age	Source code	Class code	Quadrangle	Rock class	NSA class	Label
uPzc	Phyllitic chert and siliceous phyllite	Mississippian to Permian	White-weathered, gray-green, banded phyllitic ribbon chert. Yukon-Tanana Terrane	Pennsylvanian through Permian radiolaria; Mississippian through Permian Radiolaria and conodonts		MG002	330	McGrath	Sed	5545	PMpc
PDs	Sheep Creek Formation; sublithic sandstone, limestone-chert conglomerate, and minor limestone	Middle Devonian to Permian	Medium-gray, distinctly brown-red weathered, medium- to coarse-grained, sublithic sandstone and pebble conglomerate that contains clasts of limestone, chert, lithic fragments, volcanic clasts, and polycrystalline quartz. Limestone-chert conglomerate near the top of PDs probably correlative with non-marine, conglomerate-rich Mystic subterrane rocks at Mount Dall in Talkeetna Quad. Farewell Composite Terrane;	Fusilinids (Late Pennsylvanian to Permian), Palmatolepis sp. and Polygnathus sp. conodonts (Frasnian(Late Devonian)), Dendrostrella sp. cf. D. trigemme (Late Eifelian and Givetian (Middle Devonian)),		MG002	350	McGrath	Sed	6010	PDsc
mSl	Terra Cotta Mountains Sandstone; argillaceous graptolitic limestone	Silurian	Medium- to dark-gray and brown weathered limestone containing graptolite-bearing silty sandstone intervals. Generally equivalent to Middle Limestone member of Churkin and Carter (1996). Dillinger Subterrane	Pristiograptus dubious, Monograptus cf. M. ludensis, and Monograptus digitatus (Wenlockian stage of the Silurian) Also orthoconic nautiloid cephalopods, cardiolid bivalves, and ribbed atrypacean brachiopods of probably Silurian age		MG002	390	McGrath	Sed	6660	Stc
lSl	Post River Sandstone; boundary limestone	Early Silurian	Thin, dark gray, fetid, laminated limestone with thin silty sand layers, and thin interbeds of black cherty argillite. Dillinger Subterrane	Cryptograptus centrifugus of C. centifugus zone, earliest Wenlockian stage, late Early Silurian		MG002	400	McGrath	Sed	7580	SCpl
uSsl	Terra Cotta Mountains Sandstone; thin-bedded calcareous sandstone, graptolitic shale, and silty limestone	Silurian	Thin-bedded, gray to tan, micaceous sandstone, silty limestone, and dark gray graptolitic shale. Local flute clasts and ripple marks. Probably equivalent of Upper Limestone member of Churkin and Carter (1996). Dillinger subterrane	Monograptus cf. M. pseudodubius, Lobograptus progenitor, and Pristiograptus cf. P. tumescens from the Neodiversograptus nilssoni zone, Ludlovian stage (Late Silurian)		MG002	380	McGrath	Sed	6660	Stc
mSvs	Terra Cotta Mountains Sandstone; phyllite, volcaniclastic sandstone and chert	Silurian	Thin-bedded, complexly folded, maroon to green phyllite, medium-green, medium-grained volcaniclastic sandstone, and green-gray chert. Dillinger Subterrane			MG002	385	McGrath	Sed	6660	Stc

Rock unit	Unit hame	Age	Description	Fossil	Radiometric age	Source code	Class code	Quadrangle	Rock class	NSA class	Label
mSs	Terra Cotta Mountains Sandstone; feldspathic-lithic sandstone, limey siltstone, and argillite	Silurian	Medium olive gray to terra cotta, medium-to coarse-grained, thin-bedded to massive, calcareous lithic sandstone, and siltstone containing local gray shale intervals and minor pebble conglomerate beds. Sandstones have well developed oscillation ripple marks, flute clasts, and planer crossbedding. Limey beds of lower part of the unit are thought to be equivalent of Lower Limestone member of Churkin and Carter (1996). Dillinger Subterrane	Monograptus aff. M. Priodon and Cryptograptus lundgreni (middle to early Wenlockian stage of Silurian)		MG002	395	McGrath	Sed	6660	Stc
uDl	St. Johns Hill Formation; massive micritic limestone	Devonian	Medium-gray, massive- to thck-bedded, micritic limestone that contains crypto-algal laminations, thin, black chert partings, and dolomitic nodules. Identical in age and character of unit described by Reed and Nelson (1980) near base of Mystic subterrane in Talkeetna quadrangle. Farewell Composite Terrane;	Rugose corals, brachiopods, and pelecypods (Frasnian (early Late Devoian))		MG002	365	McGrath	Sed	6931	DSml
Dls	St. Johns Hill Formation; limestone and minor siltstone	Devonian	Brown to terra cotta, micaceous, slightly pyritic, thinly laminated mudstone, siltstone, limestone, and medium-grained lithic sandstone. Tentatively correlative basal portion of PDs. Farewell Composite Terrane			MG002	370	McGrath	Sed	6931	DSml
DSl	Barren Ridge Limestone; calcarenite, calcareous siltstone, and laminated limestone	Silurian and Devonian	Thin- to thick-bedded, buff to orange-weathered, light- to medium-gray, phyllitic calcarenite, thin-bedded orange to buff siltstone, and light-gray silty limestone. Dillinger subterrane	Conodonts (Late Silurian to Late Devonian)		MG002	375	McGrath	Sed	6952	DSca
lDl	Sheep Creek Formation; massive algal limestone	Devonian	Massive, thick-bedded, medium-gray limestone, rich in algal laminations and Amiphipora sp. Farewell Composite Terrane	Ozarkodina sp. indet. or Kockelella sp. indet. (Middle Silurian-to-early Devonian)		MG002	355	McGrath	Sed	6931	DSml
lDd	Sheep Creek Formation; dolomite	Devonian	Light gray, dolomitized, algal (?) limestone similar in appearance to lDl. Thought to be correlative with lDl. Farewell Composite Terrane			MG002	360	McGrath	Sed	6931	DSml
SOsh	Post River Sandstone; graptolitic shale, siltstone, and chert	Ordovician and Silurian	Medium- to dark-gray, fetid, fissile, isoclinally folded, carbonaceous shale, siltstone, and black bioturbated, silaceous siltstone and chert. Local distinctive sulfurous plumes. One of the most complete Ordivician-Lower Silurian graptolite successions in the world. Thought to be the equivalent of Mudstone, Upper Siltstone, and Graptolite Canyon member of Churkin and Carter (1996). Also equivalent to Road River Formaion in east-central Alaska. Dillinger Subterrane	15 graptolite zones representing 5 of 6 Ordivician stages and most of the Landoverian stage of the Early Silurian		MG002	405	McGrath	Sed	7580	SCpl
OCls	Lyman Hills Formation; silty limestone and shale	Cambrian and Ordovician	Rhythmically layered, thin-bedded, orange to buff, light gray when fresh, limestone, silty shale, and light olive shale. Lime units have parallel and cross laminations. Shale and siltstone have ripple-laminated structures with amplitudes of 5 to 70 cm. Unit includes the lower Siltstone member of the Post River Formation of Churkin and Carter (1996). Dillinger Subterrane	Adelograptus graptolite zone of the Early Ordovician, Teridontis nakamurai of the Cordylodus lindstromi zone of the Late Cambrian-to-Early Ordovician		MG002	410	McGrath	Sed	7580	SCpl

Rock unit	Unit hame	Age	Description	Fossil	Radiometric age	Source code	Class code	Quadrangle	Rock class	NSA class	Label
PzpCs	Metaquartzite and calcareous phyllite	Precambrian to Devonian	Light- to medium-gray, fine- to coarse-grained, metaquartzite, quartz-feldspar "grit", calcareous phyllite, and minor metachert. Minchumina subterrane			MG002	415	McGrath	Meta	8300	CZw
Tids	Dike swarm and hornfels	Paleocene to Oligocene	Large linear zones of multiple dikes of variable composition and size that create extensive hornfels aureole and include fragments of layered country rocks			MG002	435	McGrath	Meta	1010	Thf
Qs	Surficial deposits	Holocene and Pleistocene	Surficial deposits, undifferentiated			GU002	100	Gulkana	Unconsol	100	Qs
Qa	Alluvial deposits	Holocene	Alluvial deposits			GU002	106	Gulkana	Unconsol	100	Qs
Qco	Colluvial deposits	Holocene	Colluvial deposits, river bluff type			GU002	107	Gulkana	Unconsol	100	Qs
Qc	Conglomerate	Pleistocene	Conglomerate, fluvial deposits derived from Wrangell Lava and deposited on unit QTu, undifferentiated volcanic rocks and older, pre-Wrangell rocks			GU002	112	Gulkana	Sed	100	Qs
Ql	Lacustrine deposits	Late Pleistocene	Lacustrine deposits			GU002	109	Gulkana	Unconsol	100	Qs
Qds	Active cliff-head dune deposits	Holocene	Active cliff-head dune deposits			GU002	105	Gulkana	Unconsol	100	Qs
Qnf	Volcanic rocks-Nathlie Mountain eruptive center	Pleistocene	Flows, breccias, and sedimentary rocks			GU002	127	Gulkana	Sed	300	Qv
Qcc	Volcanic rocks-Capital Volcano	Pleistocene	Caldera lavas			GU002	130	Gulkana	Ign	300	Qv
Qcs	Volcanic rocks-Capital Volcano	Pleistocene	Shield lavas			GU002	131	Gulkana	Ign	300	Qv
Qdf	Volcanic rocks-Drum Volcano	Pleistocene	Cone building flows			GU002	118	Gulkana	Ign	301	Qw
Qsf	Volcanic rocks-Sanford Volcano	Pleistocene	Basalt, andesite, and dacite lava, undifferentiated			GU002	123	Gulkana	Ign	301	Qw
Qsdf	Sanford Debris flow deposits	Quaternary	Debris derived from collapse of a dome on Sanford Volcano. Flow traveled a great distance down the Sanford Glacier/River valley to confluence with the Copper River			GU002	180	Gulkana	Unconsol	312	Qdf
Qda	Volcanic rocks-Drum Volcano	Pleistocene	Volcanic avalanche deposits			GU002	117	Gulkana	Unconsol	314	Qva
Qms	Mineral spring and mud volcano deposits	Holocene and Pleistocene	Mineral Spring and mud volcano deposits			GU002	108	Gulkana	Unconsol	315	Qmsv
Qsh	Volcanic rocks-Sanford Volcano	Pleistocene	Hyaloclastite			GU002	122	Gulkana	Ign	316	Qat
Qbc	Cinder cones and associated flows	Pleistocene	Cinder cones and associated flows			GU002	111	Gulkana	Ign	320	Qcs
Qdc	Volcanic rocks-Drum Volcano	Pleistocene	Collapsed dome			GU002	121	Gulkana	Ign	400	Qi
Qsi	Volcanic rocks-Sanford Volcano	Pleistocene	Shallow plutons			GU002	124	Gulkana	Ign	400	Qi
Qdd	Volcanic rocks-Drum Volcano	Pleistocene	Dacite domes			GU002	119	Gulkana	Ign	401	Qvd
Qdr	Volcanic rocks-Drum Volcano	Pleistocene	Rhyolite domes			GU002	120	Gulkana	Ign	401	Qvd
Qsr	Volcanic rocks-Sanford Volcano	Pleistocene	Rhyodacite dome and flow			GU002	125	Gulkana	Ign	401	Qvd
Qni	Volcanic rocks-Nathlie Mountain eruptive center	Pleistocene	Dacite pluton			GU002	126	Gulkana	Ign	401	Qvd
Qcr	Volcanic rocks-Capital Volcano	Pleistocene	Rhyolite dikes and laccoliths			GU002	128	Gulkana	Ign	401	Qvd
Qcd	Volcanic rocks-Capital Volcano	Pleistocene	Radial dike swarm and plugs			GU002	129	Gulkana	Ign	403	Qds
QTu	Volcanic rocks	Pleistocene and Pliocene (?)	Volcanic rocks, undifferentiated			GU002	110	Gulkana	Ign	450	QTv
Qwf	Volcanic rocks-Wrangell Volcano	Holocene (?) and Pleistocene	Andesite flows and fragmental rocks			GU002	115	Gulkana	Ign	455	QTw

Rock unit	Unit hame	Age	Description	Fossil	Radiometric age	Source code	Class code	Quadrangle	Rock class	NSA class	Label
QTi	Intrusive rocks	Pleistocene and Pliocene (?)	Intrusive rocks			GU002	113	Gulkana	Ign	460	QTi
Qwd	Volcanic rocks-Wrangell Volcano	Holocene (?) and Pleistocene	Dacite flows			GU002	116	Gulkana	Ign	465	QTva
Ts	Sedimentary rocks	Cenezoic	Sedimentary rocks			GU002	135	Gulkana	Sed	500	Tsu
Czab	Olivine basalt and andesite	Cenozoic	Olivine basalt and andesite			GU002	114	Gulkana	Ign	1000	Tvu
Ta	Andesite flows; Metamorphic Complex of Gulkana River	Tertiary (?)	Andesite flows			GU002	158	Gulkana	Ign	1000	Tvu
Km	Matanuska Formation	Cretaceous	Matanuska Formation			GU002	176	Gulkana	Sed	2010	Km
Kg	Granodiorite pluton	Cretaceous (?)	Granodiorite pluton, Wrangellia Terrane			GU002	137	Gulkana	Ign	2420	Kgd
Kgd	Wrangellia Terrane	Cretaceous (?)	Granodiorite pluton			GU002	136	Gulkana	Ign	2900	KJg
hbqd	Hornblende-biotite quartz diorite; Peninsular Terrane	Jurassic or Cretaceous	Hornblende-biotite quartz diorite			GU002	173	Gulkana	Ign	2900	KJg
hbqm	Hornblende-biotite quartz monzonite; Peninsular Terrane	Jurassic or Cretaceous	Hornblende-biotite quartz monzonite			GU002	174	Gulkana	Ign	2900	KJg
hbgd	Hornblende-biotite granodiorite; Peninsular Terrane	Jurassic or Cretaceous	Hornblende-biotite granodiorite			GU002	175	Gulkana	Ign	2900	KJg
Jtrd	Rhyodacite flows; Talkeetna Formation	Early Jurassic	Rhyodacite flows with minor sandstones and lesser dacite flows			GU002	177	Gulkana	Sed	3250	JTrtk
Jta	Hornblende andesite flows; Talkeetna Formation	Early Jurassic	Hornblende andesite flows			GU002	178	Gulkana	Ign	3250	JTrtk
Jts	Talkeetna Formation, sandstone	Early Jurassic	Sandstone with sparse volcaniclastics			GU002	179	Gulkana	Sed	3250	JTrtk
shgb	Schistose hornblende gabbro; Metamorphic Complex of Gulkana River	Late Jurassic or older	Schistose hornblende gabbro			GU002	164	Gulkana	Meta	3540	Jmu
scgb	Schistose clinopyroxene gabbro; Metamorphic Complex of Gulkana River	Late Jurassic or older	Schistose clinopyroxene gabbro			GU002	165	Gulkana	Meta	3545	Jmu
sqm	Schistose quartz monzonite; Metamorphic Complex of Gulkana River	Late Jurassic or older	Schistose quartz monzonite			GU002	160	Gulkana	Meta	5245	JPaur
sqd	Schistose quartz diorite; Metamorphic Complex of Gulkana River	Late Jurassic or older	Schistose quartz diorite			GU002	161	Gulkana	Meta	5245	JPaur
sgd	Schistose granodiorite; Metamorphic Complex of Gulkana River	Late Jurassic or older	Schistose granodiorite			GU002	162	Gulkana	Meta	5245	JPaur
shd	Schistose hornblende diorite; Metamorphic Complex of Gulkana River	Late Jurassic or older	Schistose hornblende diorite			GU002	163	Gulkana	Meta	5245	JPaur
ag	Amphibolite gneiss; Metamorphic Complex of Gulkana River	Late Jurassic or older	Amphibolite gneiss			GU002	166	Gulkana	Meta	5245	JPaur
Trg	Wrangellia Terrane	Late Triassic (?)	Clinopyroxene-hornblende gabbro, and diabase and gabbronorite dikes			GU002	138	Gulkana	Ign	4320	Trgb
Trcg	Wrangellia Terrane	Late Triassic (?)	Clinopyroxene-hornblende stocks and plugs			GU002	139	Gulkana	Ign	4320	Trgb
Trn	Nikolai Greenstone	Late Triassic	Nikolai Greenstone			GU002	155	Gulkana	Sed	4420	Trn

Rock unit	Unit hame	Age	Description	Fossil	Radiometric age	Source code	Class code	Quadrangle	Rock class	NSA class	Label
qmfs	Quartz-muscovite-feldspar schist; Metamorphic Complex of Gulkana River	Late Paleozoic (?) or older	Quartz-muscovite-feldspar schist			GU002	168	Gulkana	Meta	5203	PPast
mmp	Metamorphosed pelitic and calc-schist; Metamorphic Complex of Gulkana River	Late Paleozoic (?) or older	Metamorphosed pelitic and calc-schist			GU002	169	Gulkana	Meta	5209	PPast
ds	Dadina schist	Late Paleozoic (?) or older	Coarse quartz-biotite schist, altered and cataclastic meta-andesite, over lain(?) by amphibolite schist, mica-schist, and minor meta-limestone. Intruded by unmetamorphosed coarse-grained quartz diorite dikes. Also includes sheared meta-gabbro. Dadina Schist (Mendenhall, 1905). Correlated with Klutina of Schrader (1900) or with Strelna Formation of Moffit and Mertie (1923) [probably NOT Strelna].			GU002	172	Gulkana	Meta	5204	PPast
mha	Metamorphosed hornblende andesite; Metamorphic Complex of Gulkana River	Late Paleozoic (?) or older	Metamorphosed hornblende andesite			GU002	167	Gulkana	Meta	5550	PPast
PPs	Slana Spur Formation	Middle and Late Pennsylvanian and Early Permian	Slana Spur Formation			GU002	156	Gulkana	Sed	5630	PPasc
mcb	Metamorphosed clinopyroxene basalt; Metamorphic Complex of Gulkana River	Late Paleozoic (?) or older	Metamorphosed clinopyroxene basalt			GU002	170	Gulkana	Meta	5641	PPast
am	Amphibolite; Metamorphic Complex of Gulkana River	Late Paleozoic (?) or older	Amphibolite			GU002	171	Gulkana	Meta	5680	PPast
PPf	Ahtell Pluton	Permian and Pennsylvanian	Fine-grained biotite granite			GU002	145	Gulkana	Ign	5870	Pmgi
PPp	Ahtell Pluton	Permian and Pennsylvanian	Porphyritic hornblende granodiorite			GU002	146	Gulkana	Ign	5870	Pmgi
PPg	Ahtell Pluton	Permian and Pennsylvanian	Biotite-hornblende granite and granodiorite			GU002	147	Gulkana	Ign	5870	Pmgi
PPa	Diorite Complex	Permian and Pennsylvanian	Altered diabase and gabbronorite			GU002	148	Gulkana	Ign	5880	PPad
PPd	Diorite Complex	Permian and Pennsylvanian	Diorite, granodiorite, and gabbronorite			GU002	149	Gulkana	Ign	5880	PPad
Pt	Tetelna Volcanics	Pennsylvanian	Tetelna Volcanics			GU002	157	Gulkana	Ign	6220	Pat
TKhf	Hornfels	Tertiary and Cretaceous	Hornfels created from plutonic rocks described above : Km, Kmd, TKgr, TKgp, Tgd, Tqm, Tgr			MG003	647	McGrath	Meta	1970	Kk
Q	Quaternary surficial deposits, undivided	Quaternary	Surficial deposits			MG003	100	McGrath	Unconsol	100	Qs
Tcg	Nonmarine sedimentary rocks	Eocene to Oligocene	Coal-bearing sandstone, shale and conglomerate	Fossil data summarized in Bundtzen		MG003	605	McGrath	Sed	640	Tcb
Tclg	Nonmarine sedimentary rocks	Eocene to Oligocene	Limestone-rich conglomerate			MG003	606	McGrath	Sed	500	Tsu
Tgr	Granite	Tertiary	Granite of Cheeneetnuk River area		38 Ma	MG003	646	McGrath	Ign	1300	Tegr
Tqm	Quartz Monzonite	Tertiary	Quartz monzonite of Selatna Hills area		60 Ma	MG003	645	McGrath	Ign	1307	Tgdp
Tgd	Granodiorite	Tertiary	Granodiorite of the Selatna and Tatlawiksuk Hills area		61 and 62 Ma	MG003	644	McGrath	Ign	1350	Thgd
TKgr	Granite of Lone Mt. Complex	Tertiary and Cretaceous	Granite of Lone Mt. Complex		58.5 Ma and 65 Ma	MG003	642	McGrath	Ign	1655	TKg
TKgp	Granite Porphyry	Late Cretaceous and Early Tertiary	Granite Porphyry			MG003	643	McGrath	Ign	1655	TKg

Rock unit	Unit hame	Age	Description	Fossil	Radiometric age	Source code	Class code	Quadrangle	Rock class	NSA class	Label
Kcs	Kuskokwim Group; Deep Water (Turbidite-Fan) Facies	Late Cretaceous	Coarse lithic sandstone and pebble conglomerate			MG003	609	McGrath	Sed	1970	Kk
Kss	Kuskokwim Group; Deep Water (Turbidite-Fan) Facies	Late Cretaceous	Fine, medium, and coarse-grained lithic conglomerate			MG003	610	McGrath	Sed	1970	Kk
Kls	Kuskokwim Group; Deep Water (Turbidite-Fan) Facies	Late Cretaceous	Calcareous medium to coarse-grained lithic sandstone and siltstone			MG003	611	McGrath	Sed	1970	Kk
Kus	Kuskokwim Group; Lithologies of Unknown Facies Assignment	Late Cretaceous	Kuskokwim Group clastic rocks-undifferentiated			MG003	612	McGrath	Sed	1970	Kk
Ksh	Kuskokwim Group; Lithologies of Unknown Facies Assignment	Late Cretaceous	Shale and siltstone and very minor fine-grained sandstone			MG003	613	McGrath	Sed	1970	Kk
Kqs	Kuskokwim Group; Shallow Marine to Locally Nonmarine Shoreline Facies	Late Cretaceous	Quartzose sublithic sandstone, siliceous shale, and siltstone; minor coal	Leaf hash and nonmarine to brackish water pelecypod fauna		MG003	607	McGrath	Sed	1985	Kkn
Kqcs	Kuskokwim Group; Shallow Marine to Locally Nonmarine Shoreline Facies	Late Cretaceous	Coarse grained sandstone and pebble-to-cobble conglomerate. Quartz-rich sublithic to bleached white coarse facies of Kqs			MG003	608	McGrath	Sed	1985	Kkn
Kvm	Basaltic Andesite of Takotna and Candle Hills Volcanic-Plutonic Complex	Cretaceous	Basaltic Andesite of Takotna and Candle Hills volcanic-Plutonic Complex		74 Ma	MG003	648	McGrath	Ign	2270	Kvl
Kvmp	Porphyritic Basaltic Andesite of Candle Hills and Takotna Volcanic-Plutonic Complex	Cretaceous	Porphyritic Basaltic Andesite of Candle Hills and Takotna Volcanic-Plutonic Complex		73 Ma	MG003	649	McGrath	Ign	2270	Kvl
Km	Olivine Monzonite of the Candle Hills Pluton	Cretaceous	Olivine monzonite of the Candle Hills Pluton		70 Ma	MG003	640	McGrath	Ign	2470	Kg
Kmd	Monzonite and Monzodiorite of Takotna Pluton	Cretaceous	Monzonite and monzodiorite of Takotna Pluton		72 Ma	MG003	641	McGrath	Ign	2470	Kg
Trb	Tholeiitic pillow basalt	Late Triassic	Tholeiitic pillow basalt; Equivalent to Tatina River Volcanics of Buntzen and others, 1997 (Farewell Composite terrane, Mystic sub-terrane			MG003	614	McGrath	Ign	4215	JTrtv
MzPzi	Olivine Gabbro sills	Triassic to Tertiary	Olivine Gabbro sills			MG003	650	McGrath	Ign	5180	MzPzi
uPzac	Argillite and chert, equivalent to Sheep Creek Formation	Late Devonian to Permian	Argillite and chert; Equivalent to Sheep Creek Formation as defined by Buntzen and others, 1997 (Farewell Composite Terrane; Mystic Subterrane)	Pennsylvanian fossils		MG003	616	McGrath	Sed	6010	PDsc
uPzs	Sandstone and detrital limestone	Late Paleozoic	Sandstone and detrital limestone (Farewell Composite Terrane; Mystic Subterrane)	Contains Upper Paleozoic fossils		MG003	615	McGrath	Sed	6010	PDsc
PDs	Sheep Creek Formation, brown siltstone	Late Devonian to Permian	Brown siltstone of Sheep Creek Formation (Farewell Composite Terrane; Mystic Subterrane)	Pennsylvanian fusilinids		MG003	617	McGrath	Sed	6010	PDsc
SOsh	Post River Formation, Graptolitic shale and chert	Silurian and Ordovician	Graptolitic shale and chert; Post River Formation of Churkin and Carter, 1996 and Buntzen and others, 1997 (Farewell Composite Terrane; Dillinger Subterrane)			MG003	638	McGrath	Sed	7580	SCpl
Ssh	Shale and siltstone	Mid-Silurian	Shale and siltstone; equivalent to Paradise Fork Formation of Dutro and Patton, 1982 (Farewell Composite Terrane; Nixon Fork Subterrane)			MG003	624	McGrath	Sed	6620	Spf

Rock unit	Unit hame	Age	Description	Fossil	Radiometric age	Source code	Class code	Quadrangle	Rock class	NSA class	Label
mSs	Terra Cotta Mountains sandstone; feldspathic-lithic sandstone	Middle Silurian	Feldspathic-lithic sandstone; Terra Cotta sandstone of Churkin and Carter, 1996 and Buntzen and others, 1997 (Farewell Composite Terrane; Dillinger Subterrane)			MG003	637	McGrath	Sed	6660	Stc
uDl	Thick bedded dark gray limestone	Late Devonian (Frasnian)	Thick bedded dark gray limestone (Farewell Composite Terrane; Mystic Subterrane)			MG003	618	McGrath	Sed	6931	DSml
mDl	Cheeneetnuk limestone	Middle Devonian (Late Emsian to Givitian)	Cheeneetnuk limestone (Farewell Composite Terrane; Mystic Subterrane)			MG003	619	McGrath	Sed	6931	DSml
SDlw	Whirlwind Creek Formation (limestone and dolomite)	Middle Devonian (Late Emsian to Givitian (?))	Shallow water limestone and dolomite of Whirlwind Creek Formation as defined by Dutro and Patton, 1982 (Farewell Composite Terrane; Nixon Fork Subterrane)			MG003	620	McGrath	Sed	6960	DSwc
DSl	Barren Ridge limestone; calcarenite, calcareous siltstone, and laminated limestone	Silurian and Devonian	Calcarenite, calcareous siltstone, and laminated limestone; Barren Ridge limestone of Churkin and Carter, 1996 and Buntzen and others, 1997 (Farewell Composite Terrane; Dillinger Subterrane)			MG003	636	McGrath	Sed	6952	DSca
lDd	Dolomite	Early Devonian	Thick bedded, cream-colored dolomite (Farewell Composite Terrane; Nixon Fork Subterrane)			MG003	621	McGrath	Sed	6960	DSwc
lDl	Gray limestone interbedded with dolomite	Early Devonian	Gray limestone interbedded with lDd (Farewell Composite Terrane; Nixon Fork Subterrane)			MG003	622	McGrath	Sed	6960	DSwc
Sla	Algal limestone	Mid-Silurian	Algal limestone (boundstone) thick-bedded algal-rich stromatoporid-rich limestone (Farewell Composite Terrane; Nixon Fork Subterrane)	Stromatoporid		MG003	623	McGrath	Sed	6960	DSwc
uOll	Laminated limestone	Late Ordovician	Laminated limestone; Probably equivalent to upper part of Telsitna Formation of Dutro and Patton, 1982 (Farewell Composite Terrane; Nixon Fork Subterrane)			MG003	625	McGrath	Sed	7520	Ont
uOl	Limestone, limestone breccia, and argillite	Late Ordovician	Limestone, limestone breccia, and argillite; Interbedded with uOll (Farewell Composite Terrane; Nixon Fork Subterrane)	Upper Ordivician fossils		MG003	626	McGrath	Sed	7520	Ont
mOl	Thick grainstone and micritic limestone	Middle Ordovician	Thick grainstone and micritic limestone (Farewell Composite Terrane; Nixon Fork Subterrane)	Middle Ordivician fauna		MG003	627	McGrath	Sed	7520	Ont
Ol	Limestone and argillite	Middle(?) and early Ordovician	Limestone and argillite; Thought to be equivalent to Novi Mt. Formation of Dutro and Patton, 1982 (Farewell Composite Terrane; Nixon Fork Subterrane)			MG003	628	McGrath	Sed	7520	Ont
OCls	Silty limestone and shale	Cambrian and Earliest Ordovician	Silty limestone and shale; essentially equivalent to Lyman Hills Formation in Dillinger Subterrane (Farewell Composite Terrane; Nixon Fork Subterrane)			MG003	630	McGrath	Sed	7580	SCpl
OCls	Lyman Hills Formation, Silty limestone and shale	Ordovician and Cambrian	Silty limestone and shale; Lyman Hills Formation of Churkin and Carter, 1996 and Buntzen and others, 1997 (Farewell Composite Terrane; Dillinger Subterrane)			MG003	639	McGrath	Sed	7580	SCpl
lOlb	Limestone breccia and micrite	Early Ordovician	Limestone breccia and micrite; Equivalent to Novi Mt. Formation of Dutro and Patton, 1982 (Farewell Composite Terrane; Nixon Fork Subterrane)			MG003	629	McGrath	Sed	7520	Ont
OCm	Banded mudstone	Cambrian and Earliest Ordovician	Banded mudstone; Believed by Grant Abbott, 1989, to be similar to a Middle Cambrian unit exposed near Hess River in Yukon (Farewell Composite Terrane; Nixon Fork Subterrane)			MG003	631	McGrath	Sed	7520	Ont

Rock unit	Unit hame	Age	Description	Fossil	Radiometric age	Source code	Class code	Quadrangle	Rock class	NSA class	Label
Clm	Limey, striped mudstone and siltstone	Middle (?) Cambrian	Limey, striped mudstone and siltstone; Probably equivalent to OCm (Farewell Composite Terrane; Nixon Fork Subterrane)			MG003	634	McGrath	Sed	7580	SCpl
XCl	Oolitic limestone	Proterozoic to Early Cambrian	Oolitic limestone; same unit as Khuchaynik Dolomite of Babcock and others, 1994 (Farewell Composite Terrane; Nixon Fork Subterrane)			MG003	632	McGrath	Sed	8350	CZds
XCd	Oolitic, peletoidal dolomite	Proterozoic to Early Cambrian	Oolitic, peletoidal dolomite; Probably Big River dolostone of Babcock and others, 1994 (Farewell Composite Terrane; Nixon Fork Subterrane)			MG003	633	McGrath	Sed	8350	CZds
Xmso	Red ferriginous shale and orthoquartzite	Late Proterozoic	Red ferriginous shale and orthoquartzite; Correlative with Windy Fork Formation of Babcock and others, 1994. Also been called the Redstone Unit by Buntzen in 1984 (Farewell Composite Terrane; Nixon Fork Subterrane)			MG003	635	McGrath	Sed	8350	CZds
Kgm	Volcanic graywacke and mudstone	late Early Cretaceous (Albian)	Dark-greenish-gray, fine-grained to gritty(?), poorly sorted graywacke composed largely of first- and second-cycle volcanic debris but locally containing abundant granitic and metamorphic rock debris. Graded bedding common, Dark gray mudstone interbeds. Some intercalated crystal tuffs. Hornfels bordering granodiorite (Kg). Age based on correlation with HU and KT quads			RB004	2105	Ruby	Sed	2105	Kvgm
Ks	Sandstone, Quartz Conglomerate, shale, and siltstone	Probably Late Cretaceous	Non-marine deposits of olive-green, fine- to coarse-grained, crossbedded, quartzose sandstone and grit; quartz-pebble conglomerate, and dark micaeous shale and siltstone. Ironstone lenses and concretions. Better sorted and higher % quartz than Kgm. Probabaly correlative with Upper Cretaceous, plant-bearing nonmarine strata in Kateel River quad.	Abundant carbonized plant debris		RB004	1941	Ruby	Sed	1941	Kss
Kc	Igneous pebble-cobble conglomerate	late Early Cretaceous (Albian) may be as young as Late Cretaceous	Massive poorly sorted conglomerate with pebble to cobble sized clasts primarily of mafic intrusive and extrusive rocks and varied colored chert. Interbedded with fine-grained to gritty (?) , dark-green to green graywacke and mudstone. grades upward into sandstone, quartz conglomerate, shale, and siltstone (Ks). In part overlies and in part laterally gradational with volcanic graywacke and mudstone (Kgm)	Indeterminate pelecypods		RB004	2030	Ruby	Sed	2030	Kcg
Kv	Andesitic volcanic rocks	earliest Cretaceous (Neocomian) but may include Albian age strata	Koyukuk River- Pillow basalt and andesitic flows; andesitic tuffs, volcanic conglomerate, and breccia; chert and fine-grained cherty tuff; coquinoidal limestone composed largely of Buchia sp. Widely altered to a hard dark green hornfels. Dulbi-Melozitna Rivers- Andesitic and dacitic tuff, breccia, volcanic conglomerate and tuffaceous graywacke. Flows and hyabyssal bodies of andesite and dacite porphyry. Dark-green hornfels near Kg.	Buchia sublaevis, belemnite; Buchia cf.B. crassicollis; Buchia keyserlingi		RB004	2330	Ruby	Ign	2330	Kve

Rock unit	Unit hame	Age	Description	Fossil	Radiometric age	Source code	Class code	Quadrangle	Rock class	NSA class	Label
Kg	Granitic rocks	Late Cretaceous?	Granodiorite		K-Ar date of 81.5 to 89.0 Ma from similar plutons in Melozitna quad., however later data suggests Latest Cretaceous or Early Tertiary age from Nulato quadrangle.	RB004	2410	Ruby	Ign	1655	TKg
JPb	Basalt and diabase	Permian to Jurassic.	Spilitic basalt and diabase largely altered to greenstone. Along contact with Km, altered to mafic hornfels. Probabaly correlative with similar rocks on strike to the NE in the Tanana and Bettles quads			RB004	5140	Ruby	Ign	5140	JMab
JPu	Ultramafics	Permian to Jurassic	Small bodies of serpentinized peridotite and dunite with closely associated gabbro and anorthosite.			RB004	5150	Ruby	Ign	5150	Jaum
PzpCg	Gneissic rocks	Paleozoic or Precambrian	Garnetiferous quartz-feldspar-biotite gneiss of almandine-amphibolite facies. Also includes some quartzitic gneiss, amphibolitic gneiss, migmatite, small bodies of marble, and a few small bodies of granitic rock.			RB004	8630	Ruby	Meta	8801	PzZrpg
PzpCm	Metamorphic rocks (Pelitic schist)	Paleozoic or Precambrian	Pelitic schist, quartzite, and calcareous to dolomitic marble, generally of greenschist facies.			RB004	8600	Ruby	Meta	9325	PzZrqs
Qu	Unconsolidated deposits	Quaternary	Silt, sand, and gravel of stream beds, flood plains, and terraces□□□□			RB004	100	Ruby	Unconsol	100	Qs
GG	Gabbroic phaciods in McHugh Complex	Jurassic and Late Triassic(?)	Strongly altered gabbroic phacoids that are tectonic inclusions in the McHugh Complex			VA004	4890	Valdez	Meta	4890	Mzum
Kqs	Kuskokwim Group: Quartzose sublithic sandstone	Late Cretaceous	Shallow marine to fluvial facies quartzose sublithic sandstone, siliceous shale, and siltstone; part of Kuskokwim Group	Leaf hash, and brackish water pelecypods and minor coal		LH004	1986	Lime Hills	Sed	1985	Kkn
Kqcs	Kuskokwim Group: Sandstone and conglomerate	Late Cretaceous	Shallow marine to fluvial facies coarse-grained sandstone and pebble-to-cobble conglomerate; minor very coarse-grained fluvial conglomerate and sandstone; part of Kuskokwim Group			LH004	1985	Lime Hills	Sed	1985	Kkn
Kqvs	Kuskokwim Group: Sandstone	Late Cretaceous	Shallow marine to fluvial facies coarse-grained sandstone-conglomerate rich in volcanic clasts; part of Kuskokwim Group			LH004	1987	Lime Hills	Sed	1985	Kkn
Kss	Kuskokwim Group: Sandstone and siltstone	Late Cretaceous	Deep water turbidite facies fine, medium, and coarse-grained sandstone and siltstone; part of Kuskokwim Group			LH004	1970	Lime Hills	Sed	1970	Kk
Kcs	Kuskokwim Group: Turbidite facies	Late Cretaceous	Deep water, very coarse-grained, turbidite facies (proximal fan); part of Kuskokwim Group			LH004	1971	Lime Hills	Sed	1970	Kk
KJs	Kahiltna Assemblage: Turbidite sandstone and siltstone	Late Jurassic to Early Cretaceous	Fine-to-coarse grained turbidite sandstone and siltstone with minor fossil-rich, prismite-rich, limestone	Inoceramus		LH004	2850	Lime Hills	Sed	2850	KJf
Trb	Tholeiitic pillow basalt	Late Triassic age	Tholeiitic pillow basalt; part of Farewell Composite terrane and Mystic subterrane and equivalent to Tatina River Volcanics of Bundtzen and others, 1997			LH004	4215	Lime Hills	Ign	4215	JTrtv
Trvs	Volcanogenic sandstone and tuff	Late Triassic	Volcanogenic sandstone and tuff; part of Farewell Composite terrane and Mystic subterrane	Late Triassic fossils		LH004	4050	Lime Hills	Sed	4050	Trcg
uMl	Fossiliferous limestone	Late Mississippian	Fossiliferous limestone with minor siltstone; part of Farewell Composite terrane and Mystic subterrane	Fossiliferous limestone		LH004	6335	Lime Hills	Sed	6335	PMl
uDl	Thick bedded limestone	Late Devonian (Frasnian)	Thick bedded, gray, fossiliferous, limestone; part of Farewell Composite terrane and Mystic subterrane	Fossiliferous (Frasnian)		LH004	6931	Lime Hills	Sed	6931	DSml

Rock unit	Unit hame	Age	Description	Fossil	Radiometric age	Source code	Class code	Quadrangle	Rock class	NSA class	Label
Dsc	Shale and chert	Devonian (Gevitian to Frasnian)	Shale and chert; contains SEDEX barite deposits; part of Farewell Composite terrane and Mystic subterrane			LH004	6911	Lime Hills	Sed	6911	Dsc
lDl	Thick bedded limestone	Early Devonian (Emsian)	Thick bedded, dark-gray, limestone; part of Farewell Composite terrane and Mystic subterrane			LH004	6932	Lime Hills	Sed	6931	DSml
PDs	Siltstone and sandstone	Devonian to Pennsylvanian	Brown siltstone and sandstone of Sheep Creek Formation after Bundtzen and others (1997) ; part of Farewell Composite terrane and Mystic subterrane	Pennsylvanian fusilinids and brachiopods		LH004	6010	Lime Hills	Sed	6010	PDsc
Pzmu	Mystic Subterrane, undivided	Devonian to Triassic	Mystic subterrane, part of Farewell Composite terrane			LH004	5375	Lime Hills	Sed	5375	JDm
SDlw(h)	Massive micritic limestone	Late Silurian to Early Devonian	Massive micritic limestone karst rich and dolomitic; may be roughly equivalent to lower Whirlwind Creek Formation in Medfra and McGrath quadrangles; part of Farewell Composite terrane and Nixon Fork subterrane			LH004	6960	Lime Hills	Sed	6960	DSwc
Pzh	Holitna-Nixon Fork carbonates, undivided	Paleozoic	Holitna-Nixon Fork carbonates, undivided; part of Farewell Composite terrane and Nixon Fork subterrane			LH004	8340	Lime Hills	Sed	8340	DZn
DSl	Barren Ridge Limestone	Silurian to Devonian	Barren Ridge Limestone after Churkin and Carter (1996) and Bundtzen and others (1997); part of Farewell Composite terrane and Dillinger subterrane			LH004	6952	Lime Hills	Sed	6952	DSca
mSs	Terra Cotta Sandstone	Middle Silurian	Terra Cotta Sandstone after Churkin and Carter (1996) and Bundtzen and others (1997); part of Farewell Composite terrane and Dillinger subterrane			LH004	6660	Lime Hills	Sed	6660	Stc
SOsh	Post River Formation	Ordovician to Silurian	Post River Formation after Churkin and Carter (1996) and Bundtzen and others (1997); part of Farewell Composite terrane and Dillinger subterrane			LH004	7580	Lime Hills	Sed	7580	SCpl
OCls	Lyman Hills Formation	Cambrian to Ordovician	Lyman Hills Formation after Bundtzen and others (1997); a separate mappable, lime rich zone (class 7582) is shown separately; part of Farewell Composite terrane and Dillinger subterrane			LH004	7581	Lime Hills	Sed	7580	SCpl
MzPzi	Gabbro-diorite sills, dikes, and volcanics	Paleozoic and Mesozoic	Gabbro-diorite sills, dike swarms, and mafic volcanics; part of Farewell Composite terrane and Dillinger subterrane			LH004	5180	Lime Hills	Ign	5180	MzPzi
Pzdu	Dillinger subterrane, undivided	Paleozoic	Dillinger subterrane, undivided; part of Farewell Composite terrane			LH004	5310	Lime Hills	Sed	5310	DCd
Tgr	Granite	Tertiary	Coarse-grained granite		K/Ar of 55 Ma	LH004	1320	Lime Hills	Ign	1320	Tpgr
Tqm	Quartz monzonite dikes and plutons	Tertiary	Quartz monzonite dikes and small plutons		K/Ar of 55 Ma	LH004	1307	Lime Hills	Ign	1307	Tgdp
Tb	Basalt flows	Tertiary	Basalt flows		K/Ar of 58 Ma	LH004	1004	Lime Hills	Ign	1004	Tb
TKf	Felsite pluton	Cretaceous and Tertiary	Felsite pluton, age unknown			LH004	1655	Lime Hills	Ign	1655	TKg
TKqm	Quartz monzonite and diorite pluton	Tertiary and Cretaceous	Quartz monzonite to diorite pluton with gold-copper skarn		K/Ar of 64 Ma	LH004	1656	Lime Hills	Ign	1655	TKg
Dsl	Schwatka unit--Limestone	Middle and Early Devonian	Limestone			CI003	703	Circle	Sed	6945	Ds
TKk	Kichatna pluton	Late Cretaceous or Tertiary	Probably granite to tonalite			TL002	280	Talkeetna	Ign	1660	TKm
Q	Surficial deposits	Quaternary	Alluvium, colluvium, and loess			RB004	100	Ruby	Unconsol	100	Qs
TKg	Granite	Cretaceous-Tertiary	Medium- to coarse-grained equigranular to porphyritic biotite granite composed of anhedral quartz, anhedral to euhedral (porphyritic variety) K-feldspar, anhedral plagioclase and subhedral biotite		K-Ar age of 65.5 +/- 3.3 m.y. from biotite	RB004	110	Ruby	Ign	1655	TKg

Rock unit	Unit hame	Age	Description	Fossil	Radiometric age	Source code	Class code	Quadrangle	Rock class	NSA class	Label
Pzmi	Intermediate to mafic intrusive rocks	Paleozoic	Fine- to medium-grained gabbro, subordinate quartz diorite, quartz monzonite, orthopyroxene gabbro, and pyroxenite. Commonly sill-like. Wallrocks are restricted to the Rampart Group			RB004	114	Ruby	Ign	5113	JPztm
Pzrgs	Rampart Group	Paleozoic	Argillaceous and arenaceous rocks, siliceous and calcareous chemical sedimentary rocks and volcanic rocks. Pzrgs is of a lower metamorphic grade than Pzrgmsv and consists of gray, green, black, and tan slate and siltstone interbedded with green to gray gray-wacke and lesser white to green chert.			RB004	112	Ruby	Meta	5133	JMtu
Pzrgmsv	Rampart Group	Paleozoic	Argillaceous and arenaceous rocks, siliceous and calcareous chemical sedimentary rocks and volcanic rocks. Pzrgmsv is of a higher metamorphic grade than Pzrgs and consists of phyllite or fine-grained quartz-muscovite-chlorite schist intercalated with metagraywacke, recrystalized chert, and greenstone. Three cleavage planes create pencil fracturing			RB004	113	Ruby	Meta	5133	JMtu
Pzrp	Ruby Phyllite	Paleozoic (?)	Graphitic phyllite with minor interbedded graphitic quartzite and quartzite. Locally fine-grained graphitic schist and graphitic quartz-mica schist. Hornfelsed when adjacent to TKg (not shown on map)			RB004	115	Ruby	Ign	5542	TrMtqp
Pzrm	Ruby Marble	Paleozoic (?)	Medium- to coarse-grained marble composed of calcite with minor musovite, pyrite, and diopside (?). Probably correlative with Tamarack Bluff limestone			RB004	117	Ruby	Meta	6905	Dm
Pztbl	Tamarack Bluff Limestone	Paleozoic (?)	Marble and recrystallized limestone, dominantly fine- to coarse-grained calcitic marble, with some sedimentary structures preserved. Probably correlative with Ruby Marble			RB004	116	Ruby	Meta	8620	Pzrm
PzpCs	Pelitic Schist	Precambrian and/or Paleozoic	Fine- to medium-grained graphitic quartz-muscovite +/- chlorite schist. Minerology consistent with greenschist facies metamorphism			RB004	118	Ruby	Meta	8601	PzZrqs
PzpCsg	Pelitic Schist and Gneiss	Precambrian and/or Paleozoic	Medium- to coarse-grained quartz +/- muscovite +/- chlorite +/- biotite +/ grapphite +/- garnet +/- staurolite schist, quartzofeldspathic orthogneiss, and foliated greenstone. Minerology consistant with amphibolite facies metamorphism			RB004	119	Ruby	Meta	8801	PzZrpg
TKv	Volcanic and Sedimentary rocks	Tertiary (?) and/or Cretaceous (?)	Porphyritic basalt, andesite, and rhyolite flows, tuffs, and breccias with minor intercalated siltstone and sandstone			RB004	120	Ruby	Ign	1605	TKvi
Pg	Graywacke, conglomerate and mudstone	Permian	Fine- to medium-grained graywacke, graywacke conglomerate with basalt, andesite, shale, chert, quartzite, and schist clasts, and green to gray mudstone. Possibly correlative to graywacke of Rampart Group.	microfossils of probable Permian age		RB004	121	Ruby	Sed	5745	Pig
MDc	Chert and Slate	Mississippian and Devonian	Thin-banded grey, green, and red chert with thin interbeds of slate	Chert contains radiolarians of Devonian, Mississippian(?), and Mississippian age		RB004	122	Ruby	Meta	6390	TrMica

Rock unit	Unit hame	Age	Description	Fossil	Radiometric age	Source code	Class code	Quadrangle	Rock class	NSA class	Label
Qs	Undifferentiated Quaternary Deposits	Quaternary	Undifferentiated Quaternary deposits			TK003	200	Talkeetna Mountains	Unconsol	100	
KJs	Carbonate and Sandstone	Mesozoic	Slightly calcareous interbedded polymictic conglomerate, lithic graywacke, siltstone and shale. Correlative with Kahiltna flysch basin (or terrane) of Jones and others (1981) and the Gravina-Nutzotin flysch belt of Richter (1976)	late Jurassic fossil assemblage		TK003	10121	Talkeetna Mountains	Sed	2850	KJf
Trl	Limestone and Shale	Triassic	Light grey to dark grey carbonaceous limestone lenses and shale of the mafic metavolcanics and associated sediments of the Amphitheter Group	Monotis sp. of Late Triassic age		TK003	10145	Talkeetna Mountains	Sed	4030	JTrlm
Trmb	Mafic Basalt	Triassic	Very dark green-grey to reddish-oxidized, medium- to coarse-grained, mafic metabasalt of the mafic metavolcanics and associated sediments of the Amphitheter Group			TK003	10141	Talkeetna Mountains	Ign	4420	Trn
Trab	Partial marine and subareal amygdaloidal basalt flows, basaltic and andesitic tuffs, flows, dikes, sills, and agglomerates	Triassic	Dark to medium green, generally altered, partial marine and subareal amygdaloidal basalt flows, basaltic and andesitic tuffs, flows, dikes, sills, and agglomerates of the mafic metavolcanics and associated sediments of the Amphitheter Group			TK003	10142	Talkeetna Mountains	Ign	4420	Trn
Tra	Pillow basalt and andesite	Triassic	Submarine erruptive sequence of dark green, fine- to coarse-grained, pillow metabasalt and andesite of the mafic metavolcanics and associated sediments of the Amphitheter Group			TK003	10143	Talkeetna Mountains	Ign	4422	Trn
Pac	Light grey to medium grey meta-argillite, metachert, and cherty argillite intercalated with very fine-grained siliceous aquagene tuff	Permian	Light grey to medium grey meta-argillite, metachert, and cherty argillite intercalated with very fine-grained siliceous aquagene tuff. Low grade regional metamorphism. Correlated with lower portions of the Tangle subterrane of Nokelberg and Fisher (1989). Section includes the Mankomen group of Richter and Dutro (1975), Richter (1976), and Richter and others (1977)			TK003	10124	Talkeetna Mountains	Meta	5950	Pe
Pvt	Meta-andesite flows, tuff, and metasandstone	Permian	Olive green, medium-grained volcaniclastic crystal lithic tuff, pyroxene-hornblende meta-andesite flows, and metasandstone. Low grade regional metamorphism. Correlated with lower portions of the Tangle subterrane of Nokelberg and Fisher (1989). Section includes the Mankomen group of Richter and Dutro (1975), Richter (1976), and Richter and others (1977)			TK003	123	Talkeetna Mountains	Meta	5630	PPasc
lPsmv	Sheared mafic volcanic rocks	Permian	Medium greenish-grey, sheared meta-andesite and metadacite flow rocks. Minor sheared lapilli tuff. Low grade regional metamorphism. Correlated with lower portions of the Tangle subterrane of Nokelberg and Fisher (1989). Section includes the Mankomen group of Richter and Dutro (1975), Richter (1976), and Richter and others (1977)			TK003	10150	Talkeetna Mountains	Meta	6120	Pat

Rock unit	Unit hame	Age	Description	Fossil	Radiometric age	Source code	Class code	Quadrangle	Rock class	NSA class	Label
ulPla	Impure somewhat recrystallized siliceous bioclastic limestone, chert and minor quartzite	Permian	Light grey fine- to medium-grained, impure, siliceous bioclastic limestone with quartz and argillitic angular lithic detritus. Chert and minor quartzite. Low grade regional metamorphism. Correlated with lower portions of the Tangle subterrane of Nokelberg and Fisher (1989). Section includes the Mankomen group of Richter and Dutro (1975), Richter (1976), and Richter and others (1977)	Late Wolcampian to Leonardian (middle to late Early Permian) and Leonardian to Guadolupian (late Early to Early Late Permian) conodonts		TK003	10129	Talkeetna Mountains	Sed	5955	PPaskm
Pmvs	Metabasalt, meta-andesite, and metadacite	Permian	Undifferentiated altered volcanic flows, pyroclastics, and tuff. Metabasalt, meta-andesite, and metadacite. Low grade regional metamorphism. Correlated with lower portions of the Tangle subterrane of Nokelberg and Fisher (1989). Section includes the Mankomen group of Richter and Dutro (1975), Richter (1976), and Richter and others (1977)			TK003	10125	Talkeetna Mountains	Meta	5630	PPasc
Pat	Aquagene tuff, argillite and metasandstone	Permian	Dark grey to black, crystal-rich aquagene tuff with interbedded dark green-grey fine-grained volcaniclastic metasandstone and cherty argillite. Low grade regional metamorphism. Correlated with lower portions of the Tangle subterrane of Nokelberg and Fisher (1989). Section includes the Mankomen group of Richter and Dutro (1975), Richter (1976), and Richter and others (1977)			TK003	10126	Talkeetna Mountains	Meta	5630	PPasc
lPls	Silicious bioclastic limestone and argillite	Permian	Light- to medium-grey, very fine-grained, laminated siliceous bioclastic limestone composed of fine-grained carbonate, chert, angular quartz, and pelitic material. Low grade regional metamorphism. Correlated with lower portions of the Tangle subterrane of Nokelberg and Fisher (1989). Section includes the Mankomen group of Richter and Dutro (1975), Richter (1976), and Richter and others (1977)	Crinoid columnal-rich carbonate layers yield late Wolfcampian conodonts		TK003	10128	Talkeetna Mountains	Sed	5955	PPaskm
Tsk	Skarn	Permian	Skarn formed adjacent to TKif by lPls (not likely this unit)			TK003	10160	Talkeetna Mountains	Sed	4030	JTrlm
uPzdt	Dolomite and metatuff	Late Paleozoic	Distinctive white dolomitic marble and tan to green metatuff. Regionally metamorphosed from prehnite-pumpellyite through lower greenschist to amphibolite metamorphic facies. Correlated with the metamorphic complex of the Gulkana River of Nokelberg and others (1989) and the Strelna Metamorphics of Plafker and others (1989)			TK003	10130	Talkeetna Mountains	Meta	5955	PPaskm
uPzfv	Silicified felsic metatuffs and metarhyolite to metadacite flows	Late Paleozoic	Silicified felsic metatuffs and metarhyolite to metadacite flows intercalated with minor marble and dolomitic marble. Regionally metamorphosed from prehnite-pumpellyite through lower greenschist to amphibolite metamorphic facies. Correlated with the metamorphic complex of the Gulkana River of Nokelberg and others (1989) and the Strelna Metamorphics of Plafker and others (1989)			TK003	10131	Talkeetna Mountains	Meta	5625	PPast

Rock unit	Unit hame	Age	Description	Fossil	Radiometric age	Source code	Class code	Quadrangle	Rock class	NSA class	Label
uPzsv	Mafic metabasalts, metaandesites, agglomerates, minor impure carbonates and pelitic semischists	Late Paleozoic	Mafic metabasalts, metaandesites, agglomerates, minor impure carbonates, and pelitic semischists. Regionally metamorphosed from prehnite-pumpellyite through lower greenschist to amphibolite metamorphic facies. Correlated with the metamorphic complex of the Gulkana River of Nokelberg and others (1989) and the Strelna Metamorphics of Plafker and others (1989)			TK003	10132	Talkeetna Mountains	Meta	5550	PPast
uPzsl	Metapelites, mainly dark slate and phyllites	Late Paleozoic	Metapelites, mainly dark slate and phyllites. Regionally metamorphosed from prehnite-pumpellyite through lower greenschist to amphibolite metamorphic facies. Correlated with the metamorphic complex of the Gulkana River of Nokelberg and others (1989) and the Strelna Metamorphics of Plafker and others (1989)			TK003	10133	Talkeetna Mountains	Meta	5950	Pe
uPzas	Pelitic and mafic metavolcanic schist and amphibolite	Late Paleozoic	Brown to grey, biotite-rich, quartz, feldspar, pelitic and mafic metavolcanic schist. Massive, fine-grained hornblende amphibolite. Regionally metamorphosed from prehnite-pumpellyite through lower greenschist to amphibolite metamorphic facies. Correlated with the metamorphic complex of the Gulkana River of Nokelberg and others (1989) and the Strelna Metamorphics of Plafker and others (1989)			TK003	10134	Talkeetna Mountains	Meta	5920	PPast
TKif	Felsite and fine grained granite plugs	Tertiary and Cretaceous	Highly altered and weathered small bodies of felsite and fine grained granite plugs			TK003	10112	Talkeetna Mountains	Ign	1655	TKg
Kqm	Quartz monzonite	Cretaceous	Medium-grained, equigranular biotite quartz monzonite		Probably similar to other Late Cretaceous plutons in the region radiometrically dated by Turner and Smith (1974)	TK003	10116	Talkeetna Mountains	Ign	2470	Kg
Tqd	Medium- to coarse-grained, generally equigranular, hypidiomorphic pyroxene-hornblende diorite	Cretaceous	Medium- to coarse-grained, generally equigranular, hypidiomorphic pyroxene-hornblende diorite			TK003	10117	Talkeetna Mountains	Ign	2540	Kg
Tqd-f	Foliated medium- to coarse-grained, generally equigranular, hypidiomorphic pyroxene-hornblende diorite	Cretaceous	Foliated medium- to coarse-grained, generally equigranular, hypidiomorphic pyroxene-hornblende diorite			TK003	10118	Talkeetna Mountains	Ign	2540	Kg
Tqd-p	Porphyritic medium- to coarse-grained, generally equigranular, hypidiomorphic pyroxene-hornblende diorite	Cretaceous	Porphyritic medium- to coarse-grained, generally equigranular, hypidiomorphic pyroxene-hornblende diorite			TK003	10140	Talkeetna Mountains	Ign	2540	Kg
Kgab	Gabbro	Cretaceous	Medium to dark grey, eqigranular, pyroxene-hornblende rich gabbro			TK003	10115	Talkeetna Mountains	Ign	2440	Kmum

Rock unit	Unit hame	Age	Description	Fossil	Radiometric age	Source code	Class code	Quadrangle	Rock class	NSA class	Label
Mzms	Diorite, gabbro, picrite, and pyroxenite sill and dike swarm complex	Mesozoic	Diorite, gabbro, picrite, and pyroxenite, ultramafic sill and dike swarm complex. Also hypabyssal stocks and laccoliths			TK003	10127	Talkeetna Mountains	Ign	5245	JPaur
KJgd	Granodiorite	Cretaceous and Jurassic	Light to medium grey, medium-grained equigranular to gneissic biotite-hornblende granodiorite			TK003	10119	Talkeetna Mountains	Ign	3402	Jgd
KJgd-f	Foliated Granodiorite	Cretaceous and Jurassic	Foliated light to medium grey, medium-grained equigranular to gneissic biotite-hornblende granodiorite. Unit not distinguished on map.			TK003	10120	Talkeetna Mountains	Ign	3402	Jgd
gossan	gossan		gossan			TK003	110	Talkeetna Mountains	Unconsol		
Trap	Pillow basalt and andesite displaying structures	Triassic	Lava tubes and pillow structures of Tra, which is submarine erruptive sequence of dark green, fine- to coarse-grained, pillow metabasalt and andesite of the mafic metavolcanics and associated sediments of the Amphitheter Group			TK003	10144	Talkeetna Mountains	Ign	4422	Trn
uPzsvh	Hornfelsed mafic metabasalts, metaandesites, agglomerates, minor impure carbonates and pelitic semischists	Late Paleozoic	Hornfelsed mafic metabasalts, metaandesites, agglomerates, minor impure carbonates, and pelitic semischists. Regionally metamorphosed from prehnite-pumpellyite through lower greenschist to amphibolite metamorphic facies. Correlated with the metamorphic complex of the Gulkana River of Nokelberg and others (1989) and the Strelna Metamorphics of Plafker and others (1989)			TK003	10136	Talkeetna Mountains	Meta	25550	
Hf			Two outcrops within KJgd, on the southern boundary of the map.			TK003	111	Talkeetna Mountains			
TKir		Tertiary and Cretaceous	May be a typo on the map. If so, this is TKif			TK003	10113	Talkeetna Mountains	Ign	1655	TKg
Kgd-f		Cretaceous	In the Kqm description, a unit named Kgd is described as a quartz diorite. This may be a foliated quartz diorite. May also be a typo. If so, it may be Kqd-f or KJgd-f.			TK003	10114	Talkeetna Mountains	Ign	2540	Kg
KJgn		Cretaceous and Jurassic	One outcrop on the southern boundary of the map.			TK003	10122	Talkeetna Mountains		3402	Jgd
uPzsm		Late Paleozoic	One outcrop on the southern boundary of the map.			TK003	135	Talkeetna Mountains	Meta	5955	PPaskm
KJwc	Wilber Creek and Wolverine quartzite units, undivided	Cretaceous and Jurassic	Wilber Creek and Wolverine quartzite units, undivided (TN003 modified, shown as southern TrPs)			TN003	2812	Tanana	Sed	2812	KJwc
Trc	Carbonatite	Triassic	Magnetite-rich carbonatite.			TN004	3495	Tanana	Ign	4340	Trc
Dql	Quail unit, basal limestone	Late Devonian?	Local biogenic limestone buildups in basal Quail unit, deposited on the Troublsome unit. Are as much as 30 m thick and have a lateral extent of several hundred meters.			LG002	840	Livengood	Sed	6930	DSl

Rock unit	Unit hame	Age	Description	Fossil	Radiometric age	Source code	Class code	Quadrangle	Rock class	NSA class	Label
TKv	Volcanic rock	Tertiary to Late Cretaceous	Indian River, Takhakhdona Hills, and Dulbi River areas- light-gray to pink rhyolite tuff, welded (?) tuff, flows, and breccia. Subordinate pumice, dark vitrophyre, and obsidian. In Takhakhdona Hills also includesdark-green to black vesicular basalt flows. Big Creek- dark-green to green dacite and andesite porphyry flows and crystal tuffs. Probabaly correlative with similar flows and tuffs in Tanana and Bettles quads. These unit are Tertiary according to Patton (1998) however large area of TKv in the northeastern part of quad. should still be mapped as TKvr	Obsidian chippings and artifacts found in archeological site in NW AK may have source in obsidian occurrence north of Little Indian River.	Flows in Tanana and Bettles quads have K-Ar date of 58 m.y.	MZ002	210	Melozitna	Ign	1603	TKvr
Kg	Granodiorite	Late Cretaceous?	Two small plutons in the se part of quadrangle. Fine- to medium-grained hornblende-biotite granodiorite with subordinate quartz monzonite and quartz diorite. Distinguished from others to the north by Bill Patton (March, 1999)		K-Ar date of 82.3 and 89.0 m.y. from the Dulbatna Mountain pluton and 81.5 m.y. from the Indian Mountain pluton in adjoining Hughes quad	MZ002	300	Melozitna	Ign	2460	Kg
Dq	Quail unit, revision	Late Devonian?	Conglomerate, phyllite, calc-phyllite, siltstone, and sandstone. Part of unit recorrelated to Cascaden Ridge equil.			LG002	844	Livengood	Sed	6940	Dcb
Dt	Troublesome unit	Devonian(?)	Argillite, chert, and mafic intrusive and extrusive rocks			LG002	846	Livengood	Sed	6910	Dtr
Mog	Orthogneiss	Devonian	Orthogneiss		U/Pb age 350 Ma, protolith(?) age	LG003	6521	Livengood	Ign	6521	MDyao
JMr	Rampart Group and associated mafic intrusive rocks, undivided	Mississippian to Jurassic	Rampart Group volcanic and sedimentary rock sequence, mafic rocks divided out			TN003	5133	Tanana	Ign	5130	JTrtmu
Jsc	Serpentinite and or carbonatite	Jurassic?	Carbonatite of unit Jsc			TN003	3495	Tanana	Ign	4340	Trc
Kwcq	Wilber Creek unit of Weber and others (1992), quartzite	Early Cretaceous	Brown, argillaceous, impure quartzite and graywacke sandstone; locally mappable within dominantly argillaceous and graywacke section.			TN003	2118	Tanana	Sed	2115	Kwcf
JMr	Rampart Group and associated mafic intrusive rocks, undivided	Mississippian to Jurassic	Rampart Group volcanic and sedimentary rock sequence, mafic rocks divided out			TN003	5132	Tanana	Ign	5132	JMtru
PzpCsq	Schist and Quartzite	Paleozoic or Precambrian	Quartz-muscovite-biotite schist, quartz-muscovite schist, quartzite, and amphibole schist; locally garnetiferous. Upper greenschist to lower amphibolite facies. Age unknown. Unit subdivided on published OFR98-133 into PzZysa and PzZysq.			BD002	451	Big Delta	Meta	8630	PzZysa
bc	Birch Creek Schist	Uncertain but believe to be early Paleozoic or Precambrian	Light- to dark-gray, reddish-brown to tan-weathering schists, predominately quartz-sericite schist and micaeous quartzite. Includes mu-bio schist, garnet-mica schist, calcite-and dolomite-bearing schist, chloritic and graphitic schist, amphibolite, impure marble, and gneiss. Southern most part assigned to NSACLASS = 9322, part out in flats assigned to NSACLASS = 6511		120 m.y. to 1,170 m.y.	FB002	600	Fairbanks	Meta	9322	PzZaqs

Rock unit	Unit hame	Age	Description	Fossil	Radiometric age	Source code	Class code	Quadrangle	Rock class	NSA class	Label
bc	Birch Creek Schist	Uncertain but believe to be early Paleozoic or Precambrian	Light- to dark-gray, reddish-brown to tan-weathering schists, predominately quartz-sericite schist and micaeous quartzite. Includes mu-bio schist, garnet-mica schist, calcite-and dolomite-bearing schist, chloritic and graphitic schist, amphibolite, impure marble, and gneiss. Southern most part assigned to NSACLASS = 9322, part out in flats assigned to NSACLASS = 6511		120 m.y. to 1,170 m.y.	FB002	600	Fairbanks	Meta	6511	MDt?
bc	Birch Creek Schist	Uncertain but believe to be early Paleozoic or Precambrian	Light- to dark-gray, reddish-brown to tan-weathering schists, predominately quartz-sericite schist and micaeous quartzite. Includes mu-bio schist, garnet-mica schist, calcite-and dolomite-bearing schist, chloritic and graphitic schist, amphibolite, impure marble, and gneiss. Southern most part assigned to NSACLASS = 9322, part out in flats assigned to NSACLASS = 6511, part also assigned to NSACLASS = 8630		120 m.y. to 1,170 m.y.	FB002	600	Fairbanks	Meta	8630	PzZysa
bc	Birch Creek Schist	Paleozoic	Birch Creek Schist, part correlated with Spruce Creek sequence of Kantishna Hills from Bundtzen thesis			FB002	600	Fairbanks	Meta	5666	Pzsc
bc	Birch Creek Schist	Uncertain but believe to be early Paleozoic or Precambrian	Light- to dark-gray, reddish-brown to tan-weathering schists, predominately quartz-sericite schist and micaeous quartzite. Includes mu-bio schist, garnet-mica schist, calcite-and dolomite-bearing schist, chloritic and graphitic schist, amphibolite, impure marble, and gneiss. Southern most part assigned to NSACLASS = 9322, part out in flats assigned to NSACLASS = 6511. Other parts coded 5660 and 5662.		120 m.y. to 1,170 m.y.	FB002	600	Fairbanks	Meta	5660	Pzk
bc	Birch Creek Schist	Uncertain but believe to be early Paleozoic or Precambrian	Light- to dark-gray, reddish-brown to tan-weathering schists, predominately quartz-sericite schist and micaeous quartzite. Includes mu-bio schist, garnet-mica schist, calcite-and dolomite-bearing schist, chloritic and graphitic schist, amphibolite, impure marble, and gneiss. Southern most part assigned to NSACLASS = 9322, part out in flats assigned to NSACLASS = 6511. Other parts coded 5660 and 5662.		120 m.y. to 1,170 m.y.	FB002	600	Fairbanks	Meta	5662	Pzkcp
MDt?	Totatlanika Schist?	Mississippian or Devonian	Metavolcanic and metavolcaniclastic rocks. Unit added based on Bundtzen and Weber			KH005	6511	Kantishna River	Meta	6511	MDt?
Kg	Granite?	Late Cretaceous	Unit not described on source map -- missing from legend		Lead-alpha age 55-60 Ma, highly suspect.	RB005	111	Ruby	Ign	2460	Kg
Kg	Granitic rocks	probably Late Cretaceous and Early Cretaceous	Chiefly quartz monzonite in Kokrines Hills		K-Ar date of 111 Ma in Melozitna quad.	RB004	2410	Ruby	Ign	2530	Kg
Unk	Unknown		Where did this come from?			RB?	0	Ruby	Ign	4210	Trn
mcb	Metamorphic complex	Precambrian or Paleozoic	The younger unit, mcb, contains schist and quatzite with some crystalline limestone, slate, and greenstone. Part of unit recorrelated (D.N. Bradley, USGS, pers commun., 1998)			RB002	503	Ruby	Meta	7580	SCpl

Rock unit	Unit hame	Age	Description	Fossil	Radiometric age	Source code	Class code	Quadrangle	Rock class	NSA class	Label
mca	Metamorphic complex	Precambrian or Paleozoic	In eastern part of quad, metamorphic complex mapped as two units, mca and mcb. The older unit, mca is composed of crystalline limestone and greenstone with some schist and phyllite.			RB002	504	Ruby	Meta	8600	YZnm
pCm	Meta-quartz diorite	middle Proterozoic?	Sheared metamorphosed porphyritic quartz diorite		K-Ar on biotite 921 +/- 25 Ma, mouscovite in border zone 663+/- 20 Ma	RB007	8710	Ruby	Meta	8710	Ynqd
KJqa	Quartzite, argilllite, conglomerate, and hornfels	Cretaceous and/or Jurassic	Mostly gray, fine- to medium-grained quartzite, interlayered with mostly gray, greenish-gray, reddish-gray, and tan argillite (1 northwesternmost polygon at CI-LG quad boundary			CI002	400	Circle	Meta	2115	Kwcf
Kg	Granite	Cretaceous	Chloritized porphyritc (hornblende) biotite monzograinte. Also includes rocks mapped as units Kgp and Kgrd, granite or granodiorite(?) porphyry and granodiorite.		K-Ar ages range from 57 +/- 2Ma to 71 +/- 2 Ma; Ar-Ar studies suggest a likely age of 90 Ma	CI005	2460	Circle	Ign	2460	Kg
Kwcf	Quartzite, argilllite, conglomerate, and hornfels	Cretaceous and/or Jurassic	Mostly gray, fine- to medium-grained quartzite, interlayered with mostly gray, greenish-gray, reddish-gray, and tan argillite			CI003	5500	Circle	Sed	2115	Kwcf
SOs	Siltstone, dolomite, chert, and mafic igneous rocks	Silurian and/or Ordovician	Gray, black, or olive-gray siltstone and argillite and mudstone. Tan dolomite, gray to dark-gray fine-grained limestone, gray or dark-gray chert. Mafic igneous rocks are dikes, sills, and small lense-like bodies of dark-greenish-black gabbro and basalt. Two areas of exposure, northern contains chert, southern mafic igneous rocks. This NSAclass assignment is for the southern of the two areas.			CI002	6250	Circle	Ign	7610	Ofc
PzZm	Gabbro and diorite	Paleozoic or preCambrian	Gabbro and diorite and some sedimentary rocks of unknown affinity			CI003	6500	Circle	Ign	8450	MzZum
unk	Limestone	Paleozoic and or preCambrian	Various limestone symbol shown on Circle map in a variety of rock units. No further description in text. Includes on southern polygons of unit			CI002	1900	Circle	Sed	8430	ls
ch	Chert	Paleozoic and or preCambrian	Various chert symbols shown on Circle map in a variety of rock units. No further description in text. Assigned to Rampart-Tozitna sedimentary rock unit on the basis of location.			CI002	1910	Circle	Sed	5020	TrMts
PzpCq	Quartzite and quartzitic schists	Paleozoic and/or Precambrian	Gray or greenish-gray quartzite and quartzitic schists are dominant rock types. Minor pelitic schist, calc-silicate, mafic schist, and rare marble are interlayered with quartzite and quartzitic schists.			CI002	1600	Circle	Meta	9320	PzZyqs
PzpCa	Argillite, grit, and quartzite	Paleozoic and/or Precambrian	Gray, maroon, and green slaty argillite interlayered with gray and greenish-gray grit and quartzite. Minor limestone in southern part of exposure. Western exposures in part.			CI002	1000	Circle	Meta	8310	CZwa
Kgs	Graywacke sandstone and mudstone	Early(?) Cretaceous	Chiefly dark-greenish gray to pale-olive tuffaceous and feldspathic fine-to-very coarse-grained sandstone. Subordinate dark-gray mudstone. Many sandstone beds distinctly mottled due to partial zeolitization of volcanic material.	Association and gradational(?) with units containing Buchia of earliest Cretaceous age.		KT002	200	Kateel River	Sed	2180	Kvm

Rock unit	Unit hame	Age	Description	Fossil	Radiometric age	Source code	Class code	Quadrangle	Rock class	NSA class	Label
KJv	Andesitic volcanic rocks - Roundabout Mountain volcanic field	Cretaceous and Jurassic(?)	Chiefly porphyritic pyroxene andesite and trachyandesite flows, andesitic crystal and lithic tuff, and massive andesite breccia, agglomerate, and conglomerate. Commonly altered and therefore pale green. Interbedded dark-greenish-gray tuffaceous graywacke, chert, shale, and impure limestone containing Buchia. Mildly deformed and unaltered vesicular basalt and associated pyroclastic rocks along Koyukuk River near Roundabout Mt. may be of Tertiary age.			KT003	801	Kateel River	Ign	1081	Tvb
Knm	Undifferentiated sedimentary rocks	Cretaceous	Undifferientiated units Km and Kn. Units on east side of quadrangle reassigned to unit Kvg (NSA 2180).			KT002	212	Kateel River	Sed	2180	Kvm
OCls	Lyman Hills Formation	Cambrian to Ordovician	Lime rich zone in the Lyman Hills Formation after Bundtzen and others (1997); part of Farewell Composite terrane and Dillinger subterrane			LH004	7582	Lime Hills	Sed	7580	SCpl
Tnep	Northeast Prong, Tired Pup pluton	middle Tertiary	Large fine- to coarse-grained seriate, biotite or biotite-amphibole granite pluton.		K-Ar biotite ranging from 25.4 to 26.7 Ma	LH004	902	Lime Hills	Ign	1270	Togr
Pzu	Sedimentary rocks (limey)	Paleozoic	Sedimentary rocks. Undifferentiated shale, siltstone, argillite, and limestone. Fossils, chiefly grapotlites, collected from these rocks are Late Cambrian(?), Ordovician, Silurian, and Devonian in age. Tentatively correlated with Dilinger sequence of sedimentary rocks. Unit description from LH003. Consists of slected polygons re-assigned to Kahiltna flysch sequence.			LH002	190	Lime Hills	Sed	2850	KJf
TKm	Diorite, monzonite, and quartz syenite	Latest Cretaceous, earliest Tertiary	Light to medium-gray biotite-aegerine-olivine diorite, monzonite, and subordinate quartz syenite. Forms bulk of Cripple Creek Mountains pluton.		K-Ar age of 71.3 Ma	MD003	1660	Medfra	Ign	1660	TKm
TKm	Diorite, monzonite, and quartz syenite	Latest Cretaceous, earliest Tertiary	Light to medium-gray biotite-aegerine-olivine diorite, monzonite, and subordinate quartz syenite. Forms bulk of Cripple Creek Mountains pluton.		K-Ar age of 71.3 Ma	OP003	1660	Medfra	Ign	1660	TKm
Kcvs/Kcs	Coarse-grained volcaniclastic sandstone and conglomerate	earliest Cretaceous	Greenish gray, poorly sorted fine- to coarse-grained lithic-volcaniclastic sandstone and pebble conglomerate composed chiefly of volcanic rock and chert detritus, and quartz.	Inoceramus		MD003	2180	Medfra	Sed	2180	Kvm
OCl	Unknown	Cambrian and Ordovician	Unit not described. Sinlge polygon located north of coal-bearing sedimentary rocks in the southwestern McGrath quadrangle.			MG003	630	McGrath	Sed	7520	Ont
PzpCs	Greenschist and quartz mica schist	early Paleozoic or preCambrian	Medium-gray to medium-green, medium- to coarse-grained, schistose, foliated, actinolite-chlorite-epidote greenschist and biotite-chlorite-albite-quartz schist.			MD003	8601	Medfra	Meta	8601	PzZrqs
TrMc	Banded chert and argillite	Pennsylvanian and Mississippian	Medium- to dark-gray, green, and some red radiolarian chert. interbedded dark-gray argillite, and very minor tuffaceous volcanic rocks	Radiolarians		MD003	6080	Medfra	Sed	6080	TrMica
JTrt; JTrma	Siliceous tuff, crystal and lithic tuffs, and metasiltstone and Mafic volcanic breccia, tuff, siltstone, chert, and agglomerate	Triassic and early Jurassic	Dark-greenish, very fine grained cherty tuff grading into greenish-gray radiolarian chert. Fine to coarse-grained dark greenish-gray crystal and lithic tuff. Volcanic breccia and conglomerate composed of poorly sorted clasts of mafic volcanic rocks and cherty tuff in a crystal and lithic tuff matrix.	Radiolaria and conodonts reported by Patton and others, 1980 (MD002)		MD003	3851	Medfra	Ign	3851	JTrta

Rock unit	Unit hame	Age	Description	Fossil	Radiometric age	Source code	Class code	Quadrangle	Rock class	NSA class	Label
TrMv; TrMcs	Mafic tuff, volcaniclastic sandstone, and minor mafic flows and Calcareous, lithic pebble sandstone	Triassic to Mississippian	Medium- to dark-gray, coarse-grained augite-plagioclase-rich mafic tuff, volcaniclastic sandstone, and porphyritic basaltic andesite and basalt. Also, light- to medium-green-gray, medium- to coarse-grained, commonly calcareous lithic pebble sandstone and minor medium-gray siltstone containing distinctive pebbles of green-gray chert, argillite, and tuff.	Veghicyclia spp., Pseudoheliodiscus spp., and Sarla spp. of Norian age and Crytostome bryozoan, brachiopod and pelmatozoan fragments of probable late Paleozoic age		MD003	5021	Medfra	Sed	5021	TrMis
Km□	Augen orthogniess	Early Cretaceous	Gnessic phase in southern part of the Melozitna pluton now recognized as augen orthogneiss.			MZ002	370	Melozitna	Meta	6522	MDrao
PzpCp?	Pelitic and quartzose schist sequence	Paleozoic and preCambrian?	Pelitic and quartzose schist sequence, recoded as Wickersham on northern part of map.			MM002	8631	Mount McKinley	Meta	8300	CZw
PzpCp	Pelitic and quartzose schist sequence	Paleozoic and preCambrian?	Pelitic and quartzose schist sequence. Reclassified single polygon on the northeast part of map			MM002	8630	Mount McKinley	Meta	8300	CZw
Ksu?	Undifferentiated sedimentary rocks	Late and Early Cretaceous	Sandstone, shale, and conglomerate marine and nonmarine deltaic deposits in south and east part of quadrangle			NL003	1940	Nulato	Sed	2020	Kme
Kg	Turbidite deposits	Early Cretaceous	Graywacke and mudstone turbidite deposits. Polygons north of Kaltag fault on west side of quadrangle of this unit reassigned to unit Ksm			NL003	2105	Nulato	Sed	2101	Ksse
Kg	Turbidite deposits	Early Cretaceous	Graywacke and mudstone turbidite deposits. Polygons in extreme northwest of quadrangle of this unit reassigned to unit Kgw on DOG map, lumped back by W.W. Patton, Jr., (1999)			NL003	2115	Nulato	Sed	2180	Kvm
TrMb	Basalt, gabbro, diabase, tuff, and chert	Mississippian to Triassic				NL003	5130	Nulato	Ign	5140	JMab
TrMc	Banded chert and argillite	Triassic, Permian, Pennsylvanian, and Mississippian	Medium- to dark-gray, green, and some red radiolarian chert, interbedded dark-gray argillite, and very minor tuffaceous volcanic rocks.	Albaillella sp.(Middle and Late Mississippian), Latentibifistula sp. (Pennsylvanian and Permian), Capnodoce sp. (Triassic?)		OP003	6080	Ophir	Sed	5112	TrMica
Kcvs/Kcs	Coarse-grained volcaniclastic sandstone and conglomerate	earliest Cretaceous	Greenish gray, poorly sorted fine- to coarse-grained lithic-volcaniclastic sandstone and pebble conglomerate composed chiefly of volcanic rock and chert detritus, and quartz.	Inoceramus		OP003	2180	Ophir	Sed	2180	Kvm
JTrt; JTrma	Siliceous tuff, crystal and lithic tuffs, and metasiltstone and Mafic volcanic breccia, tuff, siltstone, chert, and agglomerate	Triassic and early Jurassic	Dark-greenish, very fine grained cherty tuff grading into greenish-gray radiolarian chert. Fine to coarse-grained dark greenish-gray crystal and lithic tuff. Volcanic breccia and conglomerate composed of poorly sorted clasts of mafic volcanic rocks and cherty tuff in a crystal and lithic tuff matrix.	Radiolaria and conodonts reported by Patton and others, 1980 (MD002)		OP003	3851	Ophir	Ign	3851	JTrta

Rock unit	Unit hame	Age	Description	Fossil	Radiometric age	Source code	Class code	Quadrangle	Rock class	NSA class	Label
TrMv; TrMcs	Mafic tuff, volcaniclastic sandstone, and minor mafic flows and Calcareous, lithic pebble sandstone	Triassic to Mississippian	Medium- to dark-gray, coarse-grained augite-plagioclase-rich mafic tuff, volcaniclastic sandstone, and porphyritic basaltic andesite and basalt. Also, light- to medium-green-gray, medium- to coarse-grained, commonly calcareous lithic pebble sandstone and minor medium-gray siltstone containing distinctive pebbles of green-gray chert, argillite, and tuff.	Veghicyclia spp., Pseudoheliodiscus spp., and Sarla spp. of Norian age and Crytostome bryozoan, brachiopod and pelmatozoan fragments of probable late Paleozoic age		OP003	5021	Ophir	Sed	5021	TrMis
PzpCs	Schistose metamorphic rocks	Early Paleozoic or Late Precambrian	Schistose metamorphic rocks -- Unit on northern edge of map recorrelated based on information from Bill Patton			OP002	802	Ophir	Meta	5542	TrMtqp
TrMs	None	Triassic, Permian, Pennsylvanian, and Mississippian	Sandstone, grit, and argillite -- some polygons in northeast part of map reassigned to unit PzpCph, per Bundtzen and others (1997)			OP003	601	Ophir	Sed	8601	PzZrqs
Jdr	Dishna River mafic and ultramafic rocks	Jurassic	Dishna River mafic and ultramafic rocks extension into Ophir quadrangle			OP002	600	Ophir	Ign	5191	Jium
TKva	Basaltic andesite, basalt, and lapilli tuff	Tertiary(?) and Cretaceous	Medium-greenish-gray, aphanitic to fine-grained, porphyritic, hornblende-rich basaltic andesite; uncommon basalt and very fine grained lapilli tuff(?)			OP003	1600	Ophir	Ign	1600	TKv
Ksu?	Undifferentiated sedimentary rocks -- conglomerate facies	Late and Early Cretaceous	Sandstone, shale, and conglomerate marine and nonmarine deltaic deposits in southwest part of quadrangle. Addition of subdivision by W.W. Patton, Jr., 1999			NL004	1940	Nulato	Sed	2024	Kccf
QTi	Intrusive rocks	Pleistocene and Pliocene (?)	Intrusive rocks			VA002	460	Valdez	Ign	460	QTi
mc	Metamorphic complex	Precambrian or Paleozoic	Schist, crystalline limestone, quartzite, greenstone, slate, and phyllite. Areas of crystalline limestone mapped separately when possible as mcl.			RB002	501	Ruby	Meta	9325	PzZrqs
KJs	Undivided marine sedimentary rocks	Cretaceous and Early Jurassic	Medium- to dark-gray, generally isoclinally folded, thick sequence of lithic graywacke, phyllite, and shale with local lenses of quartz-chert conglomerate. Minor fossiliferous limestone, radiolarian chert, and red ferruginous sandstone and siltstone. [Description suggests could include rocks of the Talkeetna Formation, Matanuska Formation, and Nelchina Ls. or Herendeen Fm., along with other units.] South of Denali Fault. This single polygon recoded as Chinitna Fm and Tuxedni Group, undivided based on reasonable correlation.	Inoceramus, ammonites, brachiopods, and pelecypods		TL002	301	Talkeetna	Sed	3140	Jtxc
KJs	Undivided marine sedimentary rocks	Cretaceous and Early Jurassic	Medium- to dark-gray, generally isoclinally folded, thick sequence of lithic graywacke, phyllite, and shale with local lenses of quartz-chert conglomerate. Minor fossiliferous limestone, radiolarian chert, and red ferruginous sandstone and siltstone. [Description suggests could include rocks of the Talkeetna Formation, Matanuska Formation, and Nelchina Ls. or Herendeen Fm., along with other units.] South of Denali Fault. These polygons recoded as Tatina River volcanics, upper member based on reasonable correlation.	Inoceramus, ammonites, brachiopods, and pelecypods		TL002	301	Talkeetna	Sed	3210	JTrtv

Rock unit	Unit hame	Age	Description	Fossil	Radiometric age	Source code	Class code	Quadrangle	Rock class	NSA class	Label
Kag	Argillite and lithic graywacke	Early Cretaceous	These rocks occur in a monotous, intensely deformed flyschlike turbidite sequence, probably several thousand meters thick. The rocks are highly indurated, and many are sheared and pervasively cleaved. Most cleavage is axial plane cleavage. The argillite is dark gray to black with detrital mica as much as 1 mm in diameter. Graywacke is dark to medium gray, fine to medium grained, and occurs intercalated with the argillite.	poorly preserved fossils of Incoceramus sp.; a block of Buchia-bearing limestone was found in float.		TK002	510	Talkeetna Mountains	Sed	2850	KJf