ALASKA DIVISION OF GEOLOGICAL & GEOPHYSICAL SURVEYS

PRELIMINARY INTERPRETIVE REPORT 2019-1
Werdon and others, 2019
SHEET 1 OF 1
Explanatory text accompanies map
http://doi.org/10.14509/30036

DESCRIPTION OF GEOLOGIC MAP UNITS

This map shows the distribution of bedrock units along the Alaska Highway in parts of the Mt. Hayes C-1, C-2, D-1, and D-2 quadrangles. It is the westernmost of five bedrock-geologic maps along the Alaska Highway corridor (Werdon and others, 2019; Solie and others, 2019), and is part of a multi-year project conducted by the Alaska Division of Geological & Geophysical Surveys (DGGS) between 2006 and 2013. The project focused on investigating and reporting the geology and geologic hazards of the corridor. Bedrock units were mapped and structural elements were measured in the field; where bedrock units are covered by surficial units and vegetation, units were interpreted using airborne-magnetic and electromagnetic surveys published by the Alaska Division of Geological & Geophysical Surveys (DGGS) in 2006 (Burns and others, 2006). Rock names were assigned based on field and petrographic observations, modal-mineral percentages, and interpretations of geochemical data (Werdon and others, 2014). Surficial-geologic map units are shown in Reger and others (2008). Active faults in map area are described in Carver and others (2008). Ages refer to International Commission on Stratigraphy Chart (2018). An accompanying text provides detailed map unit descriptions, acknowledgments, and references cited.

SEDIMENTARY MAP UNITS

- Tn — NENANA GRAVEL (Pliocene)
- Ts — SEDIMENTARY DEPOSITS (Miocene)

BEDROCK MAP UNITS

- buk — BEDROCK, UNKNOWN (Tertiary and older)

IGNEOUS DIKES

GRANITE DIKES (Tertiary to Cretaceous)
- Showing strike and dip
- Showing trend
- Unoriented

BASALTIC ANDESITE/ANDESITE/GRANODIORITE (Cretaceous)
- Showing strike and dip
- Showing trend
- Unoriented

DIORITE DIKES (Cretaceous)
- Showing trend
- Unoriented

GABBRO, BASALT, and LAMPROPHYRE DIKES (Tertiary to Cretaceous)
- Showing strike and dip
- Showing trend
- Unoriented

IGNEOUS MAP UNITS

Knob Ridge Monzogranite
- lKgr — KNOB RIDGE MONZOGRANITE (Late Cretaceous)

Lake George Granitic Suite
- Kls — SYENITE, QUARTZ SYENITE, ALKALI–FELDSPAR SYENITE, QUARTZ MONZONITE, AND MONZONITE (Cretaceous)
- Klg — MONZOGRANITE AND SYENOGRANITE (Cretaceous)
- Klq — QUARTZ MONZONITE (Cretaceous)

Other Igneous Rocks
- Kgd — GRANODIORITE (Cretaceous)
- Kg — GRANITE (Cretaceous)
- Km — MONZOGRANITE AND SYENOGRANITE (Cretaceous)
- Ktn — TONALITE (Cretaceous)

METAMORPHIC MAP UNITS

Amphibolite-Facies Metaigneous and Metasedimentary Rocks—Lake George Assemblage of Paraautochthonous North America
- MDlo — UNDIFFERENTIATED ORTHOGNEISS (Mississippian to Devonian)
- pMlp — PARAGNEISS AND SCHIST (pre-Mississippian)
- pMlq — QUARTZITE (pre-Mississippian)
- MDla — AMPHIBOLITE AND AMPHIBOLE–PLAGIOCLASE GNEISS (pre-Mississippian)
- pMlx — METACLINOPYROXENITE (pre-Mississippian)
- pMlu — SERPENTINITE (pre-Mississippian)

CORRELATION OF MAP UNITS

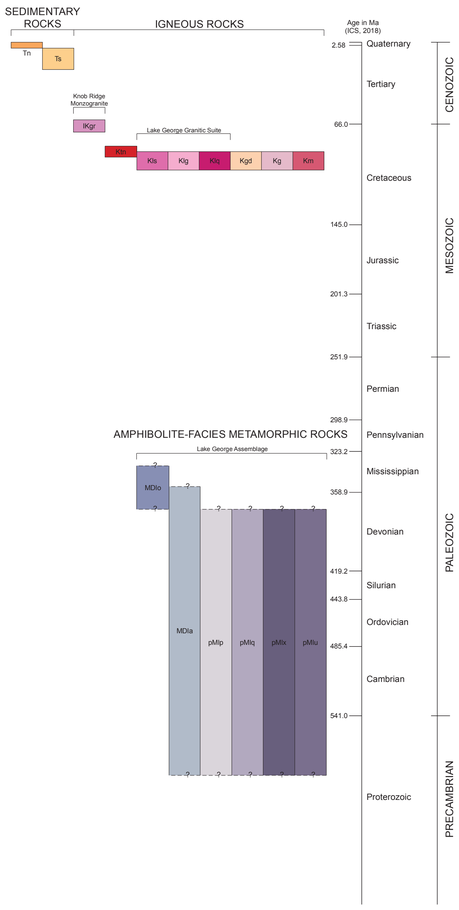


Table 1. $^{40}Ar/^{39}Ar$ age data*

Map Number	Sample	Mineral Analyzed	Map Unit	Lithology	Integrated Age (Ma)	Plateau Age (Ma)	Plateau Information	Isochron Age (Ma)	Isochron Information
A1	07RL263A	Biotite	lKgr	Monzogranite	67.3 ± 0.3	**67.6 ± 0.4**	10 fractions 68% ^{39}Ar release MSWD = 1.2	-	-
A2	07MBW793A	Hornblende	Ktn	Hornblende biotite tonalite	-	**85.9 ± 6.9**	weighted average of two 'pseudoplateaus' on two hornblendes; minimum age	-	-
A3	07LF370A	Hornblende	Kg	Biotite granodiorite	-	**89.7 ± 1.1**	weighted average of two 'pseudoplateaus' on two hornblendes; minimum age	-	-
A4	07MBW1097A	Phlogopite	dike	Biotite gabbro dike	89.5 ± 0.7	**90.9 ± 0.7**	7 fractions 85% ^{39}Ar release MSWD = 0.2	-	-
A5	06MBW003A	Biotite	Kgd	Biotite granite/granodiorite	90.5 ± 0.5	**92.9 ± 0.5**	6 fractions 85% ^{39}Ar release MSWD = 1.7	-	-
A6	07MBW1055A	Hornblende	Klq	Biotite hornblende quartz monzonite	91.4 ± 0.4	**93.2 ± 0.5**	7 fractions 90% ^{39}Ar release MSWD = 1.3	-	-
A7	06DNS013A	Biotite	Kg	Biotite granite	91.1 ± 0.5	**94.3 ± 0.5**	9 fractions 81% ^{39}Ar release MSWD = 2.5	-	-
A8	06DNS059A	Biotite	Kg	Biotite hornblende granite	93.7 ± 0.5	**94.5 ± 0.5**	10 fractions 90% ^{39}Ar release MSWD = 2.6	-	-
		Hornblende		Biotite hornblende granite	-	96.7 ± 1.0	disturbed plateau	**99.3 ± 0.8**	8 fractions $^{40}Ar/^{36}Ar_i$ = 282 ± 15 MSWD = 0.7
A9	07RL379A	Hornblende	Kls	Syenite	95.0 ± 0.6	**95.1 ± 0.5**	4 fractions 91% ^{39}Ar release MSWD = 0.4	-	-
A10	06RL007A	Biotite	Km	Biotite granite	-	**95.4 ± 0.7**	average poorly defined 'pseudoplateau' age on two biotite grains	-	-
A11	06RL013A	Biotite	Km	Biotite granite	-	**96.6 ± 0.5**	average plateau age on two biotite grains	-	-
A12	06MBW007A	Biotite	Kgd	Biotite granite	-	**99.6 ± 0.5**	consistent plateau age, average of two runs on biotite grains	-	-
		Hornblende		Biotite granodiorite/tonalite	-	**97.4 ± 1.3**	poorly defined plateau age	-	-
A13	06DNS106B	Biotite	Kg	Hornblende biotite granite	97.6 ± 0.5	**98.6 ± 0.5**	9 fractions 91% ^{39}Ar release MSWD = 2.1	98.3 ± 0.9	9 fractions $^{40}Ar/^{36}Ar_i$ = 294 ± 38 MSWD = 2.6
A14	06RL044A	Biotite	Kgd	Hornblende biotite granodiorite	-	**102.2 ± 0.5**	mean plateau age, two runs on biotite grains	-	-
A15	07RL484B	Hornblende	Mafic dike	Mafic dike	113.3 ± 1.7	**111.6 ± 1.5**	6 fractions 89% ^{39}Ar release MSWD = 0.4	-	-

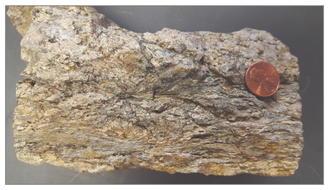
* Note: $^{40}Ar/^{39}Ar$ samples analyzed by University of Alaska Fairbanks Geochronology Laboratory. Details in Solie and others, 2013a.

Bold: Preferred age for each sample ($^{40}Ar/^{39}Ar$ ages reported at ±1 sigma).

Table 2. Fission track data*

Map Number	Sample	Mineral Analyzed	Map Unit	Lithology	Pooled Fission-Track Age (Ma)	Mean Track Length ±Standard Error (µm)	Standard Deviation of Length (µm)
F1	07MBW1007A	Apatite	Km	Megacrystic biotite granodiorite	32.9 ± 2.4	14.16 ± 0.16	1.83
F2	07RL485A	Apatite	Km	Biotite granite	49.2 ± 3.5	13.60 ± 0.18	1.84

* Note: Fission Track analyses by Apatite to Zircon, Inc. Details in Solie and others, 2013b.



Mylonitic granite from the Sand Lake fault area near Horn Mountain (photograph taken by M.B. Werdon).

Map of Station Locations

EXPLANATION OF MAP SYMBOLS

CONTACTS
- CONTACT—Identity and existence certain, location inferred

FAULTS
- FAULT—Identity and existence certain, location accurate
- FAULT—Identity and existence certain, location inferred
- FAULT—Identity or existence questionable, location inferred
- FAULT—Identity and existence certain, location concealed
- FAULT—Identity or existence questionable, location concealed
- STRIKE-SLIP FAULT, LEFT-LATERAL OFFSET—Identity and existence certain, location accurate. Arrows show relative motion.
- STRIKE-SLIP FAULT, LEFT-LATERAL OFFSET—Identity and existence certain, location accurate. Arrows show relative motion. Fault showing displacement during Quaternary time (undifferentiated)
- STRIKE-SLIP FAULT, LEFT-LATERAL OFFSET—Identity and existence certain, location approximate. Arrows show relative motion. Fault showing displacement during Quaternary time (undifferentiated)
- STRIKE-SLIP FAULT, LEFT-LATERAL OFFSET—Identity and existence certain, location inferred. Arrows show relative motion.
- STRIKE-SLIP FAULT, LEFT-LATERAL OFFSET—Identity and existence certain, location concealed. Arrows show relative motion.
- STRIKE-SLIP FAULT, LEFT-LATERAL OFFSET—Identity and existence certain, location concealed. Arrows show relative motion. Fault showing displacement during Quaternary time (undifferentiated)
- STRIKE-SLIP FAULT, LEFT-LATERAL OFFSET—Identity or existence questionable, location concealed. Arrows show relative motion.
- THRUST FAULT—Identity and existence certain, location accurate. Fault showing displacement during Quaternary time (undifferentiated)
- THRUST FAULT—Identity and existence certain, location approximate. Fault showing displacement during Quaternary time (undifferentiated)
- THRUST FAULT—Identity or existence questionable, location approximate. Fault showing displacement during Quaternary time (undifferentiated)
- THRUST FAULT—Identity and existence certain, location concealed. Fault showing displacement during Quaternary time (undifferentiated)
- FAULT SHOWING LOCAL NORMAL OFFSET—U, upthrown block; D, downthrown block.
- INCLINED FAULT—Showing dip value and direction
- FAULT LOCATED BY GEOPHYSICAL SURVEY

BEDDING
- INCLINED BEDDING—Showing strike and dip

FOLIATION
- INCLINED METAMORPHIC OR TECTONIC FOLIATION—Showing strike and dip
- INCLINED (DIP DIRECTION TO RIGHT) METAMORPHIC OR TECTONIC FOLIATION, FOR MULTIPLE OBSERVATIONS AT ONE LOCALITY—Showing strike and dip
- VERTICAL METAMORPHIC OR TECTONIC FOLIATION—Showing strike

JOINTS
- SMALL, MINOR INCLINED JOINT—Showing strike and dip
- SMALL, MINOR INCLINED (DIP DIRECTION TO RIGHT) JOINT, FOR MULTIPLE OBSERVATIONS AT ONE LOCALITY—Showing strike and dip
- SMALL, MINOR VERTICAL OR NEAR-VERTICAL JOINT—Showing strike
- SMALL, MINOR VERTICAL OR NEAR-VERTICAL JOINT, FOR MULTIPLE OBSERVATIONS AT ONE LOCALITY—Showing strike and dip

CLEAVAGE
- INCLINED CLEAVAGE—Showing strike and dip

MISCELLANEOUS MAP SYMBOLS
- A1 — $^{40}Ar/^{39}Ar$ AGE LOCALITY—Showing map number referenced in table 2
- F1 — FISSION TRACK LOCALITY—Showing map number referenced in table 1
- A—A′ — CROSS SECTION LINE AND LABEL
- HORNFELS ZONE
- MYLONITE ZONE

Geologic field investigations by:
M.B. Werdon (2006, 2007), D.N.Solie (2006, 2007), R.J. Newberry (2007), L.K. Freeman (2007), R.R. Lessard (2006), J.E. Faulds (2006)
Geologic interpretation by:
M.B. Werdon (2006, 2007), R.J. Newberry (2007), L.K. Freeman (2007), R.R. Lessard (2006), B.A. Elliott (2011, 2012), D.N. Solie (2006, 2012)
Active faults mapped by:
Carver, G.A., Bemis, S.P., Solie, D.N., and Obermiller, K.E., 2008, Active and potentially active faults in or near the Alaska Highway Corridor, Delta Junction to Dot Lake, Alaska: Alaska Division of Geological & Geophysical Surveys Preliminary Interpretive Report 2008-3D, 32 p. doi: 10.14509/17901
Geologic GIS data layers created by:
M.B. Werdon (2007, 2008), B.A. Elliott (2011), D.N. Solie (2013)
Cartography by:
P.E. Gallagher (2014)
Cartographic review by:
M.B. Werdon (2018)
Peer review by:
Cynthia Dusel-Bacon (2012), R.F. Swenson (2013), and J.V. Jones (2017)

Topographic base map from:
U.S. Geological Survey topographic maps
Mount Hayes C-1 (1955 - minor revisions 1979)
Mount Hayes C-2 (1955 - minor revisions 1973)
Mount Hayes D-1 (1954 - minor revisions 1985)
Mount Hayes D-2 (1955 - minor revisions 1962)
Projection:
Universal Transverse Mercator Zone 6 North
Datum:
North American Datum of 1927

BEDROCK-GEOLOGIC MAP, ALASKA HIGHWAY CORRIDOR, LITTLE GERSTLE RIVER TO DOT LAKE, ALASKA

by
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2019

SCALE 1:63360

1 1/2 0 1 2 3 4 5 MILES
3000 0 3000 6000 9000 12000 15000 18000 21000 24000 27000 FEET
1 .5 0 1 2 3 4 5 6 7 KILOMETERS

MOUNT HAYES C-1 AND C-2 CONTOUR INTERVAL 100 FEET
MOUNT HAYES D-1 AND D-2 CONTOUR INTERVAL 50 FEET
NATIONAL GEODETIC VERTICAL DATUM OF 1929

MAP LOCATION

Location of Map Area

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