ALASKA DIVISION OF GEOLOGICAL & GEOPHYSICAL SURVEYS

Larsen and others, PIR 2025-4A
SHEET 1 OF 1
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DESCRIPTION OF MAP UNITS

SURFICIAL UNITS

ALLUVIAL DEPOSITS

Qa — ALLUVIUM, UNDIFFERENTIATED (Holocene)
Moderately to well-sorted gravel, sand, and silt encompassing channel and overbank deposits of small streams.

Qaa — ACTIVE FLOODPLAIN ALLUVIUM (Holocene)
Moderately to well-sorted gravel and sand with minor silt, deposited as river bars and at the mouth of rivers. Experiences inundation by modern streams every five years or less (Chapin and others, 2006, as cited in Reger and others, 2021)

Qai — INACTIVE FLOODPLAIN ALLUVIUM (Holocene–Upper Pleistocene)
Moderately to well-sorted, very fine- to fine-grained sand, and silt deposited by modern rivers as overbank deposits, overlying gravelly and sandy bedload deposits . Encompasses all deposits from modern rivers subject to inundation in greater than 5-year intervals, including stream-terrace alluvium and abandoned floodplain alluvium (comparative unit from Reger and others, 2012).

Qaf — ALLUVIAL FAN (Holocene–Upper Pleistocene)
Moderately stratified, poorly sorted gravel and cobbles with a sandy matrix. Deposited subaerially by streams where their gradient is rapidly reduced, often as they emerge from the mountain front. Alluvial processes are dominant. Variable thicknesses of 10 meters or more. Active alluvial fans along Lutak Road and Haines Highway may present a risk to local infrastructure.

Qad — DELTA DEPOSITS (Holocene–Upper Pleistocene)
Moderately well-sorted, subrounded sand and silt with lesser gravel. Deposited as prograding delta aprons of the Ferebee River and Katzehin River drainages.

COLLUVIAL DEPOSITS

Qc — COLLUVIUM (Holocene)
Silty gravel and cobbles to sand and silt, with organic material that has moved downslope under the influence of gravity. Composition, grain-size distribution, and organic content are variable. Steep, glacially smoothed bedrock slopes are especially susceptible to slow-moving, downslope creep, resulting in the mixing of till, elevated beach, and elevated marine deposits. Material may move rapidly during periods of heavy rainfall, resulting in a mix of snow and avalanche debris with talus deposits. May include landslide and talus deposits too small to differentiate at the scale of mapping.

Qcta — Mixed COLLUVIUM and ALLUVIUM (Holocene–Upper Pleistocene)
Massive to poorly stratified inorganic silt mixed with sandy, angular to subangular gravel. Colluvial processes are dominant over alluvial. May be fan-shaped where deposited by debris flows at the mouth of narrow valleys or elongated in cirques and glacially steepened valleys. Locally includes glacial drift modified by colluvial and alluvial processes, as well as debris flow deposits too small to differentiate at the scale of mapping.

Qct — TALUS (Holocene)
Angular cobble- to boulder-sized rock rubble and minor sand. Common along mountain fronts, resulting from debris falls on near-vertical bedrock cliffs. Loosely packed, high void ratio, and prone to reactivation.

Qcl — LANDSLIDE (Holocene–Upper Pleistocene)
Mixture of large bedrock blocks, angular, subangular, rounded, and subrounded gravel, cobbles, and boulders, and sand and silt; deposited on steep slopes or drainages by creeping, flowing, and sliding of failed bedrock or unconsolidated surficial deposits. Includes debris flows large enough to differentiate at the scale of mapping.

MARINE DEPOSITS

Qmey — YOUNGER EMERGENT MARINE DEPOSITS (Holocene)
Clay and silt with minor sand interbedded with coarser deltaic deposits and alluvium in the upper parts. Elevated due to isostatic uplift during regional deglaciation and/or tectonic processes (modified from March, 1987).

Qmo — OLDER EMERGENT MARINE DEPOSITS (Upper Pleistocene)
Predominantly silt and clay, with some sand, medium gray color. Organic-rich zones up to one meter thick are found locally. May contain marine fossils. Deposited in fjords as fine-grained material from glaciers, rivers, and streams and subsequently uplifted by isostatic rebound and/or tectonic processes (Lemke and Yehle, 1972; March, 1987).

BEACH DEPOSITS

Qb — MODERN BEACH DEPOSITS (Holocene)
Chiefly loose, moderately well-sorted, stratified, fine- to coarse-grained sand, subrounded gravel, and angular to subangular boulders. Deposits extend from mean low water to the upper limits of wave action (modified from March, 1987).

Qeb — ELEVATED BEACH DEPOSITS (Holocene–Upper Pleistocene)
Moderately well-sorted, stratified deposits of elevated shore and delta sediments composed of rounded to subrounded sand and gravel. Elevated above sea level by isostatic rebound and/or tectonic processes (modified from March, 1987). Reaches an altitude of approximately 90 m, maybe as high as 180 m.

GLACIAL DEPOSITS

Qgo — GLACIAL OUTWASH (Holocene–Upper Pleistocene)
Poorly to moderately well-sorted, stratified, subrounded gravel and sand with lesser silt and cobbles deposited by glacial meltwater. Includes meltwater deposits of modern glaciers and Pleistocene outwash terraces on modern stream margins and inlets. May be widespread beneath elevated marine deposits (Lemke and Yehle, 1972).

Qgf — GLACIAL OUTWASH FAN (Holocene)
Poorly sorted, stratified gravel and sand deposited by glacial meltwater near the termini of glaciers. Unit description after March (1987).

Qgr — ROCK GLACIER (Holocene–Upper Pleistocene)
Heterogeneous deposits of angular to subangular gravel, cobbles and boulders with an ice matrix. Characterized by hummocky or lobate (stair-step) landscape, occurring chiefly in cirques. Subject to slow downslope movement where active.

Qgt — GLACIAL TILL (Holocene–Upper Pleistocene)
Light to medium gray to greenish gray, poorly sorted gravel, sand, and silt, with lesser clay and cobbles. Gravel and cobbles are subrounded to subangular and are chiefly clasts of local bedrock. Upper 50 centimeters to one meter may be oxidized yellowish orange to orangish brown. Deposited directly by glacial ice and may include ground moraine, end moraine, and areas of thinly covered bedrock. Minor ice-cored deposits may be present in recently deglaciated areas. Locally modified by colluvial and/or fluvial processes.

Qgl — GLACIAL LACUSTRINE (Upper Pleistocene)
Well-sorted deposit of predominantly clay and silt deposited by a proglacial lake impounded behind a moraine that separates Chilkoot Lake from Lutak Inlet in the north-central part of the map area.

PALUDAL DEPOSITS

Qp — PALUDAL (Holocene)
Very dark brown organic swamp deposits. Fibrous and locally woody peat interlayered with thin beds of organic silt and sand. Thickness variable.

MANMADE DEPOSITS

Qmf — ARTIFICIAL FILL (Holocene)
Areas of human-emplaced fill. Also found in road embankments and building site fill, but these are too small to differentiate at this map scale.

OTHER

Glaciers

Water

BEDROCK UNITS

CHILKAT BLOCK

TAKHIN BLOCK

Igneous Rocks

Tgd — GRANODIORITE (Tertiary)
Medium-grained, equigranular, hornblende–biotite granodiorite and hornblende–biotite quartz diorite. Description from Gilbert and others (1987).

Tcd — CATACLASTIC DIORITE (Tertiary)
Fine- to medium-grained hornblende diorite or granodiorite that exhibits strong cataclastic foliation. Description from Gilbert and others (1987).

Tfd — FOLIATED DIORITE (Tertiary)
Medium-grained, equigranular quartz diorite and hornblende diorite that generally display both flow foliation and compositional layering. Description from Gilbert and others (1987).

Kwg — GRANODIORITE AND OTHER PLUTONIC ROCKS (Cretaceous)
Medium- to coarse-grained, equigranular hornblende–biotite granodiorite and diorite Minor quartz diorite and tonalite. Generally massive but locally foliated (Gilbert, 1988). Inferred to be in igneous contact with **PZvt** to the east.

Kgdf — FOLIATED GRANODIORITE (Cretaceous)
Light gray, very fine- to coarse-grained, weakly to moderately foliated biotite–hornblende granodiorite. Metasedimentary and igneous xenoliths locally common. Locally porphyritic, with biotite and hornblende phenocrysts 1- to 10-cm long. In igneous contact with **PZvs** to the east.

Bedded Metamorphic Rocks

MDph — BLACK PHYLLITE (Mississippian–Devonian)
Locally tightly folded black phyllite, black slate, and dark gray metasiltstone. Locally limonitic and commonly contains up to 25 percent phyllitic calc-siltstone and 25 percent thin-bedded, fissile, sooty limestone. Description from Gilbert and others (1987).

MDlt — SOOTY LIMESTONE (Mississippian–Devonian)
Sheared, laminated, gray, sooty limestone with thin bioclastic beds. Age is likely Devonian or Mississippian, based on preliminary identification of conodonts from a single locality in the unit. Description from Gilbert and others (1987).

Four-Winds Complex

Pzv — METAVOLCANIC ROCKS (Ordovician–Silurian)
Green-gray, fine-grained actinolite schist; quartz schist; calc-schist and carbonaceous phyllite; and minor slate. Intercalated marble bodies up to 100 m thick locally. Mylonitic to ultra-mylonitic at the contact with Pzam to the west. To the north, this unit can also include mafic and felsic schist, black phyllite, and calc-schist that represent metamorphosed basalt, intermediate and silicic flows and pyroclastic rocks, volcanogenic sediments, impure chert, shale, and calc-siltstone (Gilbert and others, 1987).

Pzvs — METAVOLCANIC AND METASEDIMENTARY ROCKS (Silurian)
Variable assemblage of schistose volcanoclastic rock, dark gray slate, metabasalt, and marble. Locally includes minor amounts of gneiss, felsic schist, or chert. May be hornfelsed near contact with Keg to the west. Description from Gilbert (1988).

Pzam — CALC-SCHIST (Silurian)
Light gray to light-tannish brown to blue-green calc-schist, minor hornblende–biotite schist, quartzite, and siliceous marble. May be finely intercalated at meter scale.

CHILKOOT AND FEREBEE BLOCKS

Plutonic and Volcanic Rocks

Tbqm — LEUCOCRATIC QUARTZ MONZONITE (Tertiary)
Occurs as small plugs and dikes concentrated in the Chilkat block, south and west of Tukgaho Peak. Plugs are medium-grained granular rocks, with 40 percent K-feldspar, 40 percent plagioclase, 20 percent quartz, and 1–3 meters biotite. Dikes have a sucrosic texture and may contain small red garnets. This rock intrudes the metabasalt (Trmb) and Mount Kashagnak pluton (Kqm/Kkgd) (Redman and others, 1984).

Kkhd — HORNBLENDE DIORITE (Cretaceous)
Medium- to coarse-grained hornblende diorite to quartz diorite. Moderately foliated, seriate rock composed of plagioclase feldspar and hornblende with minor quartz, K-feldspar, and trace magnetite. Epidote commonly replaces hornblende. Rare K-feldspar megacrysts near the upper contact with middle Mount Kashagnak intrusive unit. Grain size ranges from 2 to 6 mm and exhibits a seriate texture. Hornblende is linoated. Local meter-scale layers of hornblende gabbro occur with similar textures to main hornblende diorite phase. Fresh surfaces are generally dark gray to green; weathers dark brown. Unit comprises the outer zone of the Mount Kashagnak plutonic complex.

Kkgd — GRANODIORITE (Cretaceous)
Leucocratic, medium-grained, porphyritic, foliated hornblende granodiorite and minor quartz monzodiorite and quartz monzodiorite. Mineralogy consists of 30–40 percent plagioclase, 20–30 percent K-feldspar, 5–15 percent quartz, 5–20 percent hornblende, and accessory magnetite. Petrographically identified late epidote is common, particularly around primary hornblende. Coarse, pink K-feldspar megacrysts occur throughout the unit and range in size from 1–6 cm. Fresh surfaces are generally pale gray to pink, with buff to light gray weathering. Intermediate unit of the Mount Kashagnak plutonic complex between the rim and core.

Kqm — QUARTZ MONZONITE (Cretaceous)
Leucocratic, medium-grained, hornblende–biotite quartz monzonite porphyry with distinctive K-feldspar megacrysts up to 7 cm in length. K-feldspar megacrysts contain biotite inclusions whose cleavage parallels host crystal faces. Matrix is equigranular with grain sizes ranging from 2–4 mm. Biotite ranges from 10–15 percent with hornblende comprising approximately 5 percent. Quartz ranges from 10–15 percent with minor matrix K-feldspar (~10 percent). Including megacrysts, K-feldspar accounts for up to 20–30 percent of the rock. Titanite and magnetite are common accessory minerals. Core of the Mount Kashagnak plutonic complex.

Pzqm — HORNBLENDE PYROXENITE (Cretaceous)
Coarse- to very coarse-grained hornblende pyroxenite. Subhedral crystals of hornblende, pyroxene, and plagioclase 0.5–3 cm long. Majority of rock (80 percent) is composed of hornblende pseudomorphs after pyroxene. Hornblende–plagioclase–thulite pegmatites are abundant and display sharp and gradational contacts with the pyroxenite. Locally, pegmatites occur within fine-grained biotite–hornblende pyroxenite. Unit is intruded by KKhd and contains abundant inclusions of Kp (Redman and others, 1984).

Kp — PYROXENITE AND HORNBLENDITE (Cretaceous)
Fine- to very coarse-grained clinopyroxenite and hornblendite with up to 5 percent biotite, and variable magnetite. Crosscut by intrusions of the same mineralogy and numerous generations of mono-mineralic veins of hornblende, clinopyroxene, and magnetite. Malachite staining is common. K-Ar hornblende analyses yielded 99 Ma and 96 Ma ages (MacKevett and others, 1974). Occurs as extremely abundant inclusions in unit Kum. Main ultramafic body is intensely fractured and contains veins of clinoenstite and dikes of quartz monzonite. Unit description from Gilbert and others (1987).

TKtb — METABASALT AND METAVOLCANICS (Triassic)
Dark- to medium-green, dense to vesicular or amygdaloidal, aphanitic to finely and sparsely porphyritic, non- to moderately foliated basalt. Pillows and columns are locally present. Commonly flow-banded. Tuffaceous layers are present south of Haines and outside of the map area. Two to 3 percent phenocrysts of hornblende and plagioclase <2mm in length, occasionally up to 1 cm. Rock is commonly altered to chlorite and epidote. Foliated and non-foliated volcaniclastic siltstone interbeds occur locally between lava flow deposits. Marginal autoclastic breccias occur locally. Gilbert and others (1987) cite associated Triassic fossils. Metabasalt is intruded by KKhd.

Sedimentary Rocks

Tk — KOOTZNAHOO FORMATION (Tertiary)
Restricted to Kochu Island west of the Chilkat Peninsula. Light to medium gray, cobble-to-boulder clast- and matrix-supported conglomerate and lesser sandstone that form tabular packages several meters to 10s of meters thick. Internally disorganized. Clast compositions are dominated by subrounded to angular diorite cobbles to boulders up to 2 m long and subrounded to subangular metabasalt cobbles. A few foliated greissic clasts are also present. Locally, monomictic beds of diorite boulders are matrix-supported. Rare, recessive intervals two to several meters thick and one notable covered interval of several tens of meters. One thin example of fissile black shale within a recessive interval. Entire succession greater than 100 m thick.

Kcgn — GRAVINA (Cretaceous–Jurassic)
Dark gray to black, very fine-grained sandstone, siltstone, and argillite. Platy to blocky weathering of tabular beds 1–150 cm thick. Plane-parallel laminated to locally crossbedded. Ripple marks and convolute bedding locally present. Larger weathering blocks are commonly carbonaceous, and the occurrence of red to green chert is locally common. Beds may be strongly folded at meter to decimeter scale and display well-defined cleavage parallel to fold axes. Unit is in fault contact with Trmb to the east.

CHILKOOT AND FEREBEE BLOCKS

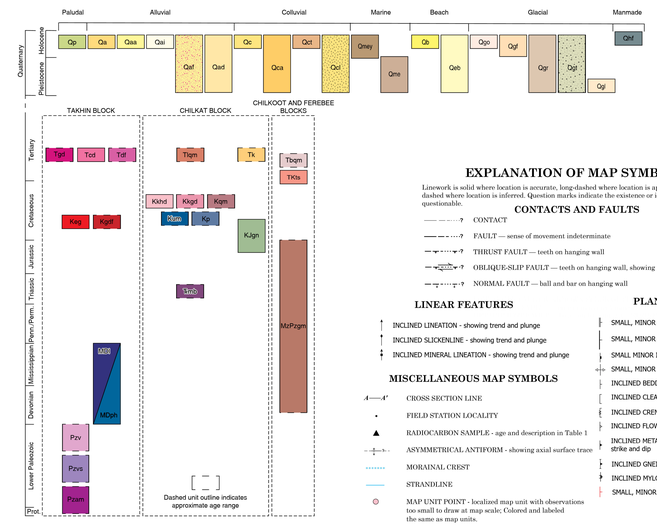
Plutonic and Metamorphic Rocks

Tbqm — BIOTITE QUARTZ MONZONITE (Tertiary)
Fine- to medium-grained, locally porphyritic, biotite quartz monzonite to granite. Phenocrysts are coarse poikilitic plagioclase feldspar. Cross cuts MzPzgm and local TKts. Fresh surfaces are dark gray to pink, weathers dark gray. Color Index is <15.

TKts — TONALITE SILL (Tertiary, Paleocene, and late Cretaceous)
Variably foliated and lineated, medium- to coarse-grained, hornblende- and biotite-bearing tonalite to granodiorite and minor quartz diorite. Exhibits a pervasive granoblastic texture. Deformed by a strong penetrative foliation and pervasive mineral lineation along the western edge of the unit, which dissipates to the east and structurally upward into a seriate and locally porphyritic texture, with plagioclase phenocrysts up to 2 cm. Accessory titanite is evident in outcrop locally. Fresh surfaces are light gray to pink with dark gray weathering. Color Index varies from 5 to 40. Hosts numerous map-scale and smaller screens of MzPzgm.

MzPzgm — GNEISS AND MIGMATITE (Mesozoic and Paleozoic)
Biotite-bearing quartzofeldspathic paragneiss, foliated amphibolite, calc-silicate gneiss, migmatite, and minor orthogneiss forming screens ranging in size from meters to km-scale hosted in locally deformed unit TKts. Gneisses are granoblastic and contain a wide range in modal mineralogy, averaging approximately 45 percent quartz, 35 percent feldspar, 15 percent biotite, and minor hornblende. Gneissic layering in migmatitic paragneiss is defined by alternating bands of biotite-rich layers divided by variably thick granitic leucosome.

CORRELATION OF MAP UNITS



EXPLANATION OF MAP SYMBOLS

Linework is solid where location is accurate, long-dashed where location is approximate, and short-dashed where location is inferred. Question marks indicate the existence or identity of the feature is questionable.

CONTACTS AND FAULTS

CONTACT
FAULT — sense of movement indeterminate
THRUST FAULT — teeth on hanging wall
OBLIQUE-SLIP FAULT — teeth on hanging wall, showing right lateral offset
NORMAL FAULT — ball and bar on hanging wall

LINEAR FEATURES

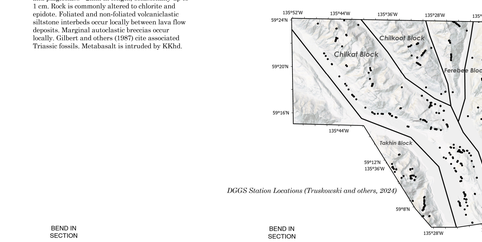
INCLINED LINEATION - showing trend and plunge
INCLINED SLICKENLINE - showing trend and plunge
INCLINED MINERAL LINEATION - showing trend and plunge

PLANAR FEATURES

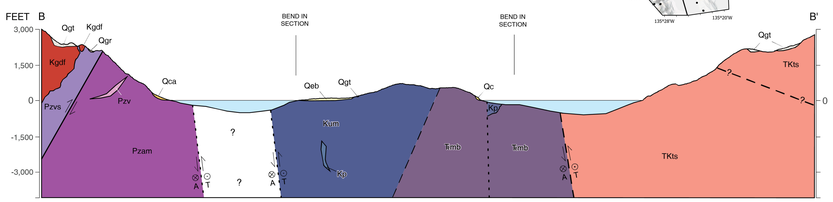
SMALL, MINOR INCLINED DIKE - showing strike and dip
SMALL, MINOR INCLINED FAULT - showing strike and dip
SMALL MINOR INCLINED JOINT - showing strike and dip
SMALL, MINOR FOLD - showing orientation of axial surface
INCLINED BEDDING - showing strike and dip
INCLINED CLEAVAGE - showing strike and dip
INCLINED CRENULATION CLEAVAGE - showing strike and dip
INCLINED FLOW BANDING - showing strike and dip
INCLINED METAMORPHIC or TECTONIC FOLIATION - showing strike and dip
INCLINED GNEISSIC LAYERING - showing strike and dip
INCLINED MYLONITIC FOLIATION - showing strike and dip
SMALL, MINOR INCLINED VEIN - showing strike and dip

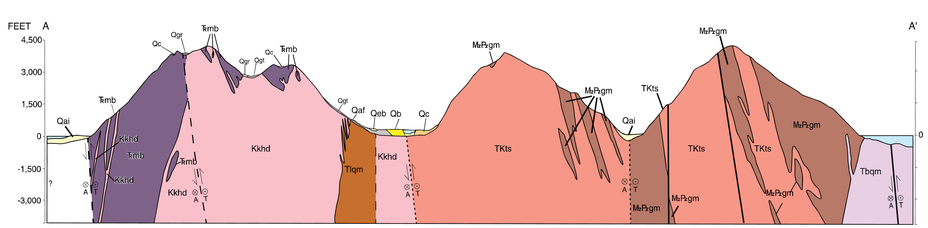
MISCELLANEOUS MAP SYMBOLS

A—A' CROSS SECTION LINE
FIELD STATION LOCALITY
RADIOCARBON SAMPLE - age and description in Table 1
ASYMMETRICAL ANTIFORM - showing axial surface trace
MORAINAL CREST
STRANDLINE
MAP UNIT POINT - localized map unit with observations too small to draw at map scale; Colored and labeled the same as map units.



DGGS Station Locations (Truskowski and others, 2024)





Cross-sections show 2x vertical exaggeration

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Geologic Map of the Haines-Takshanuk Mountains-Chilkat Peninsula Area, Southeast Alaska, Parts of Skagway A-1, A-2, B-1, B-2, B-3 Quadrangles, Alaska

by

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2025

SCALE 1:50 000

CONTOUR INTERVAL 250 FEET

Location of Map Area

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Table 1: CARBON-14 SAMPLE RESULTS

RADIOCARBON SITE	DGGS SAMPLE ID	LAB ID [1]	MATERIAL ANALYZED	^{14}C AGE CAL. YR. BP	SAMPLE DEPTH (cm)	SAMPLE LOCALITY
HNSC-1	23MMD012	Beta - 691376	Organics in a well-graded sand with silt	2,251±95	50	Left flank of a debris flow
HNSC-2	23MMD021	Beta - 691377	Organics in a poorly-graded sand with gravel	304±26	200	Alluvial fan covering uplifted marine deposits; exposed in gravel pit off Lutak Road
HNSC-3	23MMD022	Beta - 691378	Woody debris	230±84	70	Alluvial fan covering uplifted marine deposits; exposed in gravel pit off Lutak Road
HNSC-4	23MMD025	Beta - 691381	Organics in a poorly-graded sand with gravel	Bp50	115	Upper portions of the alluvial fan deposits; exposed in gravel pit off Lutak Road
HNSC-5	23MMD029B	Beta - 691382	Marine bivalve	12,730±140	420	Cut slope of private driveway, sample obtained from uplifted marine deposit

[1] All conventional radiocarbon ages were determined using Beta Analytic Testing Laboratory. Calibrated radiocarbon ages were determined using the CALIB Rev 8.1.0 Program using INTCAL20
[2] Age in ^{14}C yr B.P. is conventional age in years before A.D. 1950 with quoted laboratory counting error of one standard deviation.
[3] Nicolazzo, J.A., Darrow, M.M., and Walser, S.L., 2024, Soil index properties and radiocarbon ages of the Haines-Takshanuk Mountains-Chilkat Peninsula area (STATEMAP project, Southeast Alaska: Alaska Division of Geological & Geophysical Surveys Raw Data File 2024-27. https://doi.org/10.14509/31418

Projection:
Universal Transverse Mercator Zone 8N
Datum:
North American Datum of 1983
Geologic field investigations and interpretation by:
M.C. Larsen, C.M. Truskowski, Walser, S.L., J.A. Nicolazzo, R.J Gillis., K.F. Bull, Regan, S.P., Darrow, M.M. (2023)
Geologic GIS data layers created by:
C.M. Truskowski and S.L. Walser (2024)
Cartography by:
C.M. Truskowski (2024), A.E. Macpherson (2024)
Cartographic review by:
M.D. Hendricks (2024)
Peer reviewed by:
T.D. Hubbard (2025)

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