ALASKA DIVISION OF GEOLOGICAL & GEOPHYSICAL SURVEYS

Preliminary Interpretive Report 2025-6
Herriott and others, 2025
SHEET 1 OF 1



MAP UNIT DESCRIPTIONS

SURFICIAL DEPOSITS (QUATERNARY)

Qal — ALLUVIAL DEPOSITS (Pleistocene–Holocene)—Undifferentiated alluvium (interpreted from satellite imagery).

Qg — GLACIAL DEPOSITS (Pleistocene–Holocene[?])—Undifferentiated, unconsolidated sediments of principally glacial origin (modified from Detterman and others, 1963).

BROOKIAN MEGASEQUENCE (CRETACEOUS)

Lithologic descriptions in part modified from Herriott and others (2018)

SCHRADER BLUFF FORMATION, regional lower part (Turonian–Campanian)

Ksbls — SENTINEL HILL MEMBER (Santonian–Campanian)—Brown to light- to dark-gray, locally distinctly brown- and brown-purple-weathering, mainly thin-bedded, moderately to poorly indurated, tuffaceous to locally siliceous, faintly ripple cross-laminated to wispy, disrupted, or convolute laminated mudstone and very fine-grained sandstone, with subordinate light-gray- to brown-purple-weathering, plane-laminated to ripple cross-laminated to locally trough cross-stratified, very fine-grained sandstone in amalgamated bedsets to ~10 m thick. Recessive intervals are common, comprising "popcorn"-weathering, light- to dark-gray, bentonitic claystone and yellow-green- to pistachio-lime-colored bentonite. Amalgamated sandstone lithofacies contains thin lag deposits of intra-formational mudstone rip-up clast conglomerates, with laminae defined by carbonaceous debris and rhizoliths locally observed. Trace fossil assemblages commonly include *Schaubcylindrichnus*, *Paleophycos*, and locally densely packed *Phycosiphon*. Shell fragments from large *Sphenoceramus* are locally observed. Member is regionally interpreted to record shallow-marine sedimentation and is readily mapped at Twin Bluffs syncline (see fig. 1 below). An excellent exposure of the lower part of Sentinel Hill Member also occurs at Schrader Bluff (Detterman and others, 1963), which is ~17 km north of the map area.

Ksblb — BARROW TRAIL MEMBER (Santonian)—Light-gray to tan to brown to blue-gray-green, thin- to medium-bedded, typically well indurated, low-angle wavy, trough, hummocky, and swaley cross-stratified, locally argillaceous, locally carbonaceous and woody debris-bearing, tuffaceous, erosionally resistant very fine- to fine-grained sandstone, with subordinate gray, medium- to thick-bedded, carbonaceous mudstone, dark-gray to black, thin-bedded, siliceous tuff, and chocolate-brown to olive-green, medium-bedded, "popcorn"-weathering bentonitic tuff. Sandstone beds are locally ripple cross-laminated and locally exhibit sharp, scoured bases with up to 80 cm of erosional relief. Siderite nodule, sandstone rip-up clast, and extra-basinal clast conglomerates occur as thin lag deposits. Sandstone and mudstone beds are locally bioturbated, and discrete trace fossils include *Macaroichnus*, *Asterosoma*, and *Schaubcylindrichnus*; a medium- to dark-gray, hackly weathering, well indurated, very fine-grained sandstone and mudstone lithofacies distinctly occurs in this unit and is commonly intensely bioturbated by *Phycosiphon*. Prismatic calcite detritus, likely from *Inoceramus* shells, is locally abundant, as are partially preserved *Sphenoceramus* specimens. Member is regionally interpreted to record shallow-marine sedimentation; the unit is readily mapped at Racetrack Basin, and the Twin Bluffs exposure of the unit is extraordinary (see fig. 1 below). An excellent exposure of Barrow Trail Member also occurs north of the map area at Schrader Bluff (Detterman and others, 1963).

Ksblr — ROGERS CREEK MEMBER (Turonian–Santonian)—Light- to dark-gray to olive-brown, thin- to medium-bedded, typically poorly indurated, tuffaceous to bentonitic, ripple cross-laminated to structureless siltstone and mudstone, with subordinate light-gray- to light-tan-weathering, locally thick-bedded, tuffaceous, ripple cross-laminated, locally well developed hummocky and swaley cross-stratified, coarsening and thickening upward packages of very fine- to fine-grained sandstone. Distinctive light-yellow- to white-weathering, very well indurated, siliceous tuff beds locally observed, as are rare, buff-weathering, very well indurated limestone beds with a probable siliciclastic constituent. Recessive intervals are common and inferred to contain abundant bentonite based on "popcorn"-weathering of colluvium. *Skolithos* traces and *Sphenoceramus* body fossils are observed in the sandstone facies. Member is regionally interpreted to record shallow-marine sedimentation and is mapped southeast of Twin Bluffs and at Racetrack Basin, although the unit is typically covered by vegetation in the map area. An excellent exposure of Rogers Creek Member occurs to the north of the map area at Schrader Bluff (Detterman and others, 1963).

Ktu — TULUVAK FORMATION (Turonian)—Lower part of unit comprises tan- to brown- to orange-brown-weathering, medium-gray to medium-brown, mainly thin- to medium-bedded, commonly normally graded, well indurated, moderately-sorted, lithic- and locally quartz-rich, locally carbonaceous (including coalified woody debris), erosionally resistant very fine- to medium-grained sandstone, with subordinate thin-bedded, plane-parallel laminated mudstone. Mudstone rip-up clasts and siderite nodules as clasts are locally observed in sandstone beds, as are symmetrical ripples and low angle cross-stratification. Middle and upper parts of unit commonly comprise light-gray to light-brown-weathering, light-gray, quartz- and chert-rich, fine- to very coarse-grained sandstone and conglomeratic sandstone and sand-matrix-rich to clast-supported, granule to cobble conglomerate. Formation is regionally interpreted to record shallow-marine sedimentation in its lower part and non-marine to shallow-marine sedimentation in its middle and upper parts. Tuluvak in the Racetrack Basin map area is readily mapped along Racetrack Basin syncline, where light-gray, quartz-rich conglomeratic sandstone and conglomerate is observed in bedrock rubble and small outcrops near the inferred contact with overlying Schrader Bluff Formation. Excellent exposures of marine and non-marine Tuluvak also occur along uplands of Ayiyak Mesa syncline within the map area, as well as at Shale Wall Bluff, Schrader Bluff, and Outpost Mountain (Detterman and others, 1963); these latter localities are ~5–17 km north of the map area.

Ks — SEABEE FORMATION (Cenomanian–Turonian)—Tan-gray- to medium-gray-weathering, medium- to dark-gray, thin-bedded, dominantly poorly indurated, tuffaceous to bentonitic, locally fissile, plane-parallel laminated to rippled siltstone, mudstone, shale, and claystone, with subordinate tan-gray-weathering, medium-gray, thin- to very thick-bedded, locally well indurated, commonly normally graded, low-angle cross-stratified (for example, hummocky, swaley, and irregularly) very fine-grained sandstone. Discrete, very thin-bedded, poorly indurated, bentonitic and tuffaceous horizons are common, and mudrock-dominated zones in the Seabee are typically covered in bentonitic slope wash that exhibits a characteristic "popcorn"-weathering style. *Inoceramus* shells, shell fragments, and prismatic calcite detritus are locally observed. Formation is regionally regarded to principally record deep-marine sedimentation, although shallow-marine deposits occur where the unit's base overlies Nanushuk Formation and near the lithostratigraphic transition with overlying Tuluvak Formation. Seabee is a regionally recessive-weathering unit that is covered by vegetation in the Racetrack Basin area, with the best nearby exposures occurring immediately to the east within the south limb of Rooftop Ridge anticline (Herriott and others, 2025) and at Shale Wall Bluff (Detterman and others, 1963), which is ~5 km north of the map area.

Kn — NANUSHUK FORMATION (Albian[?]–Cenomanian)—Tan- to gray-brown- to rusty-brown-weathering, medium-gray to light-brown to gray-brown, thick- to very thick-bedded, dominantly well indurated, commonly normally graded, locally structureless but commonly trough, hummocky, swaley, or tabular (planar and tangential) cross-stratified, mainly fine- to medium-grained sandstone. The fine- to medium-grained sandstone lithofacies is commonly overlain by subordinate dark-gray- to gray-brown- to light-rusty-brown-weathering, medium-gray to tan-gray to tan, very thin- to thin-bedded, moderately well indurated, ripple to low-angle cross-laminated to plane-parallel laminated very fine-grained sandstone and mudstone. Centimeter-scale, coalified wood fragments and very thin pebbly lags are locally observed. Oil-stained sandstones are observed immediately east of the map area within both limbs of the Rooftop Ridge anticline. Formation is interpreted to record shallow-marine sedimentation in the Racetrack Basin map area, where it is best exposed along the Rooftop Ridge and Kayak Mountain anticlines. One of the regionally excellent exposures of the unit lies immediately east of the map area in the south limb of the Rooftop Ridge anticline along the west bank of the Nanushuk River (LePain and others, 2021; Herriott and others, 2025; see fig. 2 below).

Kt — TOROK FORMATION (Albian–Cenomanian[?])—Gray- to gray-brown-weathering, light-to dark-gray, thin- to very-thin-bedded mudstone, siltstone, and silty mudstone, with subordinate fine- to medium-grained sandstone. Formation is regionally interpreted to record deep-marine sedimentation, although outer-shelf deposits likely occur at the unit's top near the lithostratigraphic transition with overlying Nanushuk Formation. In the eastern extent of the Racetrack Basin map area, unit is inferred to lie under vegetation within the axial zones of the Rooftop Ridge and Kayak Mountain anticlines, and in fact Torok crops out in the core of the Kayak Mountain anticline along a creek in the southeast corner of the map area (see fig. 2 below). Torok is regionally interpreted to record deep-marine sedimentation and recognized as an important mechano-stratigraphic unit that accommodates penetrative and thrust-related deformation associated with detachment folds, which are themselves commonly modified by thrusts that cut across overlying Nanushuk Formation and locally breach the surface (for example, Mull and others, 2004; Herriott and others, 2018).

Correlation of Map Units

Surficial Deposits	Qal / Qg		Quaternary
Brookian Megasequence	Ksbls	Campanian	Upper Cretaceous
	Ksblb	Santonian	
	Ksblr	Coniacian	
	Ktu	Turonian	
	Ks	Cenomanian	
	Kn	?	
	Kt	Albian	Lower Cretaceous

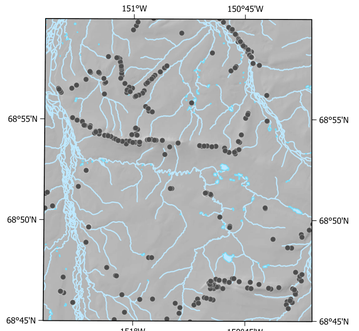
EXPLANATION OF MAP SYMBOLS

- Contact—long-dashed where approximately located; short-dashed where inferred; queried where uncertain
- Traceable beds
- 45 — Bedding—showing strike and dip
- Outcrop extent
- Outcrop photograph figure location

FAULTS AND FOLDS

linework long-dashed where approximately located; short-dashed where inferred; queried where uncertain

- Fault
- Thrust or reverse fault—sawteeth on hanging wall
- Anticline
- Syncline



Station locations visited during the 2021 field season (267 total).



Figure 1. Oblique aerial view northward across the south limb of the Twin Bluffs syncline at Twin Bluffs, with the Nanushuk River in the foreground (see northeast corner of map for location). Lowermost Sentinel Hill Member (Schrader Bluff Formation) strata crop out along the top of the bluff at the center-skyline, and most of this >300-m-thick section at Twin Bluffs ostensibly comprises Barrow Trail Member (Schrader Bluff Formation). Ongoing sedimentologic and geochronologic studies at this locality aim to better understand the nature of this seemingly anomalously thick expression of Barrow Trail. Topographic relief of the bluff at photo-center is ~95 m, for sense of scale (photograph by T.M. Herriott).



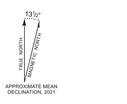
Figure 2. Oblique aerial view north-northeastward across the core and north limb of the Kayak Mountain anticline along a small tributary of the Nanushuk River (see southeast corner of map for location). This meandering creek exposes the Torok Formation (small cutbank exposures at center- and right-foreground), which commonly occupies axial zones of anticlines in the Brooks Range foothills fold-and-thrust belt (for example, Herriott and others, 2018) but is typically covered by vegetation or lies in the subsurface beneath resistant Nanushuk Formation strata. Here, Nanushuk crops out at photograph-left, and the Rooftop Ridge section of Nanushuk (LePain and others, 2021) is visible in the center-background immediately below the skyline. Visible reach of creek extends for ~775 m across the foreground, for sense of scale (photograph by T.M. Herriott).

GEOLOGIC MAP OF THE RACETRACK BASIN AREA
Central North Slope, Alaska

by

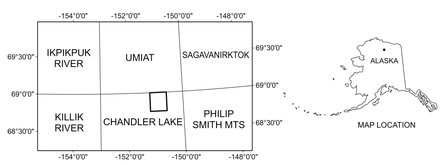
Trystan M. Herriott[1], Marwan A. Wartes[1], Amanda L. Willingham[2], Robert J. Gillis[1], and Kamil A. Qureshi[1]

2025



SCALE 1:63360

1 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



Location of Map Area

Geologic field investigations by:
R.J. Gillis (2021), T.M. Herriott (2021), S.E. Portnoy (2021), M.A. Wartes (2021), and A.L.Willingham (2021)
Geologic mapping by:
R.J. Gillis (2021), T.M. Herriott (2021), M.A. Wartes (2021), and A.L.Willingham (2021)
Geologic GIS data layers created by:
M.D. Hendricks (2019), A.L. Willingham (2019), A.E. Macpherson (2022), and K.A. Qureshi (2024, 2025)
Cartography by:
A.E. Macpherson (2022), K.A. Qureshi (2024, 2025)
Peer-review by:
J.H. Long (2025)

Basemap streams and waterbodies from:
National Hydrography Dataset, U.S. Geological Survey, Reston, Virginia. 2002-2016
Basemap hillshade and contours from:
U.S. Geological Survey, EROS Data Center, 2013, Digital elevation - Interferometric Synthetic Aperture Radar (IFSAR) - Alaska
Projection:
Universal Transverse Mercator Zone 5N
Datum:
North American Datum of 1983

Funding by:

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LePain, D.L., Kirkham, R.A., and Montayne, Simone, 2021, Measured stratigraphic section, Nanushuk Formation (Albian-Cenomanian), Nanushuk River (Rooftop Ridge), Alaska: Alaska Division of Geological & Geophysical Surveys Preliminary Interpretive Report 2021-5, 8p., 1 sheet. https://doi.org/10.14509/30744

Mull, C.G., Houseknecht, D.W., Pessel, G.H., and Garrity, C.P., 2004, Geologic map of the Umiat Quadrangle, Alaska: U.S. Geological Survey Scientific Investigations Map 2817-A, 1 sheet, scale 1:250,000.

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