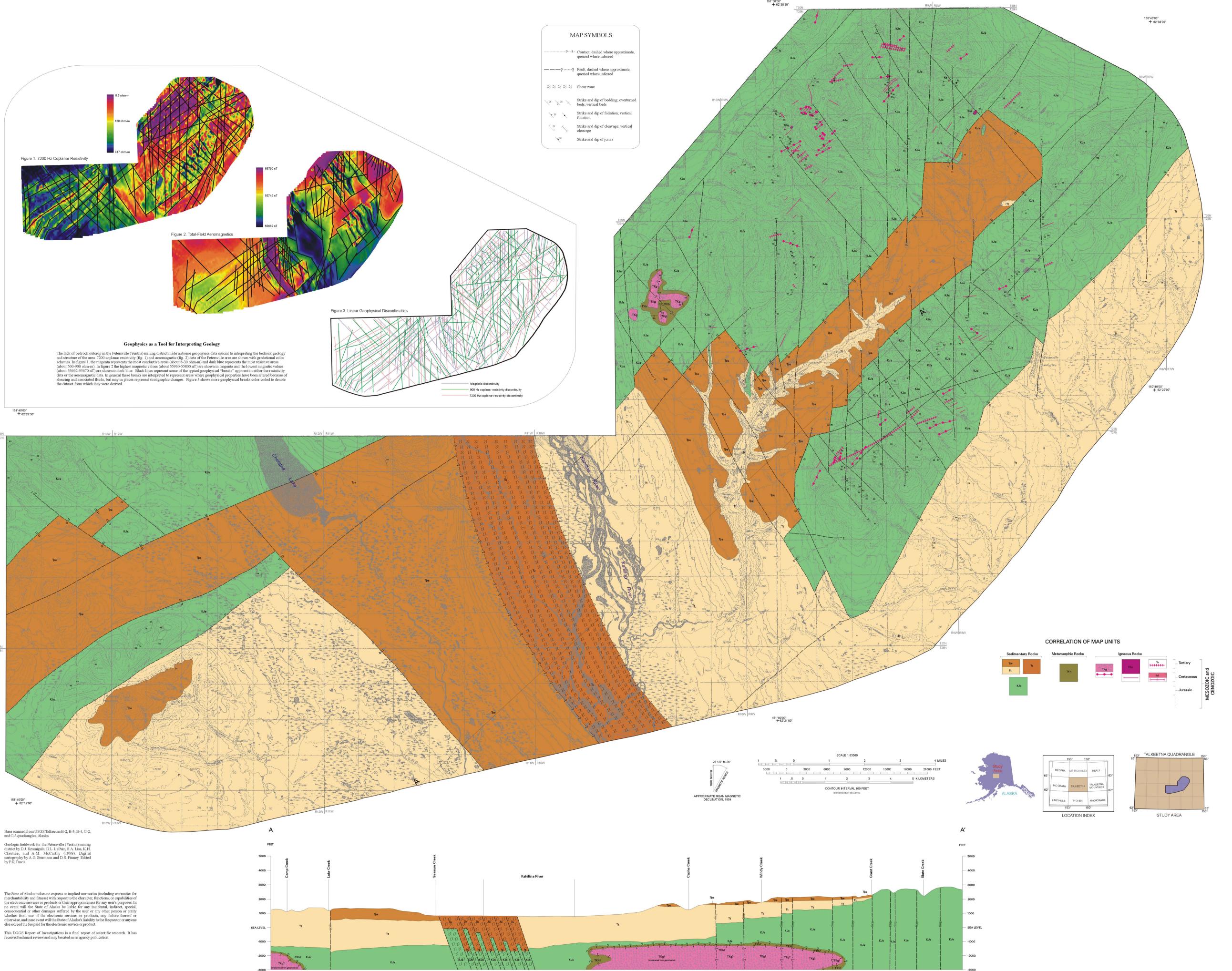
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Interpretive bedrock-geologic map of the Petersville (Yentna) mining district, Alaska

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DESCRIPTION OF MAP UNITS

STERLING FORMATION (Pliocene) — Orange, light tan, or light gray, medium- to thick-bedded, gold-bearing conglomerate and minor sandstone, siltstone, and coal. Conglomerate is the dominant lithology, and is distinguished from Tyonek Formation conglomerate by color, relative coarseness, and clast lithology. Clasts are well rounded, equant, and average 5-10 cm in diameter. Clasts to 30-cm diameter are not uncommon. Conglomerate is clast-supported and poorly to moderately well indurated. Matrix material is silty sand and is locally clayey and ferruginous. Where ferruginous matrix is present, tens of centimeters thick and extending several meters along strike. Clast lithologies observed include biotite granite, red cher altered felsic volcanics, black shale, dark blue-black undifferentiated volcanics, black slate with quartz veins (Kahiltna assemblage), black to dark gray siltstone with leached pyrite cubes, and polymictic pebble conglomerate (Cantwell Formation?). Coal fragments in Sterling Formation southwest of the Yentna River (T 25 N, R 14 W) suggest that this formation is at least partly derived from Tyonek Formation. Conglomerates usually display crudely developed horizontal stratification, but locally may include beds lacking internal stratification (massive beds) or displaying decimeters-thick sets of planar cross strata. Depending on outcrop size, conglomerate beds either appear sheet-like or lenticular, with lateral continuity of lenticular conglomerate beds ranging from a few meters to several tens of meters.

Sandstone lenses are widespread, but are a relatively minor component of the Sterling Formation. Sandstone lenses range from a few centimeters to approximately 60 cm thick and commonly do not extend more than a few meters along strike. Sandstone is orange to tan-brown weathering, medium- to very coarse-grained, locally pebbly, and usually has internally massive or horizontal stratification. Planar and trough cross bedding are locally present. Crossbed sets in sandstones and conglomerates nonzonial strainfeation. Fratial and trong closs because present clossocial sets in sanitations and congromerates suggest current flow toward the east or southeast; clast imbrication in conglomerates near mouth of Falls Creek (Talkeetna B-3 Quadrangle, Secs. 30 and 31, T 28 N, R 9 W) suggest current flow toward the south and southeast.

Bedding appears conformable (possibly disconformable) on Tyonek Formation at some locations where contact can be observed, but is unconformable in at least one location in Cache Creek drainage (roadcut exposure north of confluence of Falls and Cache creeks), where a slight angular discordance was measured. Apparent thinning of Tyonek Formation to northwest, culminating in overlap of Sterling Formation directly onto basement in the foothills, and inclusion of possible Tyonek Formation coal fragments in the Sterling Formation suggest that Sterling Formation basal contact is an angular unconformit along the mountain front. Maximum thickness at Fairview Mountain is 770 m, but thickness may be greater beneath the lowlands, in the vicinity of the Peters Hills, thickness ranges from a featheredge to at least 200 m.

The U.S. Bureau of Mines sampled the conglomerate member of the Sterling Formation (Fechner and Herzog, 1990) Conglomerate member is approximately 15 m thick in upper Wonder Gulch and contained between trace and 0.007 ounces of gold per cubic yard. No detectable platinum group elements were present. The Tertiary conglomerate represents a high-volume, low-grade gold resource with good placer gold exploration potential and it may the source for most of the placer gold found in alluvial gravels throughout the Petersville mining district.

conglomerate, siltstone, claystone, and coal. Sandstone is dominant lithology, with subordinate siltstone, claystone, and coal Volcanic ash layers have been reported in Tyonek Formation from this area (Reed and Nelson, 1980). Reed and Nelson (1980) divided Tyonek Formation into a sandstone member and a conglomerate member. Numerous exposures of the sandstone member are present in Cache Creek drainage and on south and east sides of the Peters Hills; previously mapped exposures of conglomerate member were limited to Fairview Mountain area. During this study's fieldwork, exposures in Fairview Mountain area previously mapped as conglomerate member were covered with gravelly colluvium from the Sterling Formation. Consequently, this formation is undivided in the map area.

The undivided Tyonek Formation is organized in fining-upward cycles ranging from 3 m to at least 20 m thick. Cycles grade upward from pebble gravel or very coarse-grained sand, through finer sand-size grades, to interbedded silt, clay, and coal. Thickness of each lithology varies widely from one fining-upward succession to another. Conglomerate is light to medium gray, commonly iron-stained, poorly indurated, clast-supported, polymictic, and includes a matrix of sand-sized material. Conglomerate clast lithologies include granule- to pebble-sized white vein quartz, red chert, dark gray to black slate and sandstone (Kahiltna assemblage?), black mafic (?) material, and intraformational clasts of mudstone and coal. At the outcrop scale, conglomerate most commonly occurs as sheet-like structureless lags at base of channel-fill successions, and less commonly as lenticular bodies situated at or near base of channel-fills. Lenticular conglomerates usually display crude to well-

 $developed \ horizontal\ stratification\ or\ trough\ cross\ stratification\ in\ sets\ 0.3\ m\ to\ at\ least\ 1\ m\ thick.$ $Sands to ne \ makes \ up \ the \ bulk \ of \ this \ formation. \ \ Sands to ne \ weathers \ light \ tan-brown \ to \ medium \ gray, is \ stained \ red-brown, and$ is fine- to very coarse-grained. Coarser grained sandstone is commonly pebbly. Sandstone is poorly to moderately sorted and includes angular to subrounded grains of chert and cherty argillite (30-40 percent), quartz (mostly undulose and polycrystalline classified as feldspathic chert litharenite. Sandstone beds range from a few centimeters to several meters in thickness and display a variety of sedimentary structures, including horizontal stratification, trough cross stratification, ripple cross lamination, and low-relief (few decimeters to 0.5 m) scour and fill structures with concave-upward scour surfaces overlain by scour-concordant laminae (eta cross stratification of Allen, 1963). Possible lateral accretion structures have also been recognized in some channel-fills. Near-horizontal pebble stringers 1 to 2 clasts thick are common in sandstone and line intra channel scour surfaces. Pebbles are locally common in sandy foreset laminae. Ovoid-shaped iron concretions are locally abundant in sandstones and range from a few centimeters to 45 cm long parallel to bedding. Most fining-upward sandstone successions are overlain by mudstone successions, however, amalgamated sandy channel-fill successions have also been

light tan to medium brown. Localized red-brown staining is common. Mudstone successions consist of interbedded siltstone, claystone, and coal. Laminated siltstone is most common lithology in the mudstone successions and commonly includes thin laminae of finely divided plant fragments. Twigs and logs are common in siltstone and often localized near contacts with underlying channel-fill sandstone. Claystone interbeds weather light to medium gray and commonly have a bleached appearance, particularly beneath coal seams. Coal seams range from a few centimeters to approximately 1 m thick and are usually associated with an underlying bleached claystone (underclay). Brown, woody coal with recognizable plant detritus is The thickness of the Tyonek Formation is unknown. At least 3,000 m of Tyonek Formation is present in discontinuous

exposures along an unnamed creek south of String Creek, on the southeast side of the Peters Hills (Sec. 18, T 27 N, R 8 W, NDIVIDED SEDIMENTARY ROCKS (Tertiary) — Mixed assemblage of Sterling and Tyonek Formations. Interpretation

of airborne-magnetic and resistivity surveys (Staff, 1997a, 1997b, 1997c) indicates a large shear zone in this area and no clear contact between the two Tertiary sedimentary rock formations. NDIVIDED MARINE SEDIMENTARY ROCKS OF THE KAHILTNA ASSEMBLAGE (Cretaceous-Jurassic) -Medium- to dark-gray, generally isoclinally folded, thick sequence of lithic sandstone, phyllite, and shale with local lenses of quartz-chert-pebble conglomerate. Where stratigraphic facing direction is unequivocal, bedding is commonly overturned. Sandstone is thin to thick bedded and locally shows graded bedding, ripple marks, cross bedding, and pull-apart structures

Sole markings are locally abundant and include flute casts, prod marks, and load structures. Sandstone is poorly to moderately well sorted, fine-to coarse-grained, and consists of angular to subangular detritus, of which quartz and lithic fragments make up about 50 percent (litharenite). Some sandstone includes greater than 15 percent pelitic matrix (lithic wackes). Lithic fragments are fine-grained recrystallized quartzite or metachert with lesser amounts of dark siltstone or argillite, muscovite schist, and Phyllite is generally very fissile and locally forms pencil/rod fragments. Fine-grained disseminated pyrite and/or pyrrhotite are common in all Kahiltna lithologies, with higher abundances near igneous units. Up to 40 percent euhedral pyrite occurs in thin lenses (3 to 5 mm wide) within graywacke in the Dollar Creek drainage (Clark and Hawley, 1968). Extremely rare *Inoceramus* and trace fossils were found. Thickness of the unit is unknown. METAMORPHIC ROCKS

HORNFELS/GRANOFELS (Late Cretaceous—Tertiary) — Dark gray to black thermally metamorphosed Kahiltna Formation Texture ranges from fine-grained and compact hornfels to medium-grained granofels with andalusite needles up to 0.5 cm long. Argillaceous rocks are locally thermally metamorphosed to spotted cordierite and andalusite hornfels near the larger igneous bodies. Sandstone is thermally metamorphosed to biotite—quartz.hornfels/granofels with minor andalusite crystals, very finerained biotite plates, and abundant opaque minerals. Largest body of hornfels/granofels occurs at west end of the Dutch Hills in Whistler Creek drainage. This unit is likely reversely magnetized (see Griscom, 1979), with a large body in Whistler Creek drainage represented by a weakly magnetized body on the total field magnetics map (Staff, 1997a). Small zones of this unit occur throughout the Dutch Hills at scales too small to represent on this map. Hornfels is clearly associated with Late

ALASKITE/ALKALI GRANITE (Tertiary) — White, gray, and light pink to salmon colored, sucratic textured with porphyritic phenocrysts of quartz, feldspar, and biotite, igneous bodies of Late Cretaceous or Tertiary age. Pinkish color is due o oxidation of altered mafic minerals and disseminated sulfides. Unit is present as dikes generally 1 to 3 m wide, with wides lmenite?) are mostly destroyed by alteration and weathering. Limonite staining is common on fractures. Up to 2 percent of the rock volume comprises disseminated pyrite and/or arsenopyrite grains (or oxidized remnants). Sulfide grain size ranges between 0.2 and 0.8 mm across. Local bleaching of Kahiltna Assemblage units extends 2–3 m from some dike margins. Three samples of alkali granite were selected for 40 Ar/99 Ar dating. Potassium feldspar 40 Ar/99 Ar plateau ages range from 54 to 56 Ma); an isochron age of 57.8 Ma was obtained from white mica, and two whole-rock samples yielded a plateau age of 53.5 Ma

are associated with silver-tin-beryllium-uranium-rubidium-boron mineralization with high silver/gold (>50) in skarn and

Cretaceous—Tertiary) — Light- to medium-colored igneous rocks of Late Cretaceous or Tertiary age. Intrusive bodies range from dikes to plugs and stocks. Known stocks occur on the western side of the Dutch Hills in the Whistler Creek drainage. Textures range from equigranular to porphyritic, with an average grain size of approximately 3 mm for equigranular bodies. agnetized body on the total field magnetics map (Staff, 1997a). Whole-rock analyses of these rocks (Pinney and others 98b) plot predominantly within granodiorite field on a Streckeisen plot, but compositions also occur within granite and quartz monzodiorite fields. Petrographic studies reveal that dikes are composed of, in approximate order of abundance plagioclase, quartz, and orthoclase, with subordinate and varying amounts of biotite, hornblende, clinopyroxene, apatite, rutile, and opaque minerals. Phenocrysts range in size from approximately 2 to 10 mm and constitute 30 to 50 percent of rock volume. Biotite is the dominant mafic phase, occupying 15 to 25 percent of the rock volume. The rock contains up to 10 percent Six granitoid rocks were selected for 6 Ar $^{\beta\eta}$ Ar dating. Biotite 46 Ar $^{\beta\eta}$ Ar plateau ages (five analyses) range from 66.1 to 71.5 Ma; an isochron age of 66.8 Ma was obtained from white mica, and homblende plateau ages (two analyses) ranged from 66.1 to 66.4Ma. Biotite is believed to have undergone argon loss in Tertiary time due to intrusion of Ta units.

Native gold, arsenopyrite, and scheelite occur in quartz veins crosscutting fine-grained granitic dikes in the Bird Creek drain of the Dutch Hills (Pinney and others, 1998a; Hawley and Associates, 1978). Slightly alkalic, intermediate composition plutons and dikes of similar age occur in the Chulitna mining district (Clautice and others, 1998). Mineralization associated with those igneous rocks is low silver/gold (high gold) gold-arsenic-bismuth-base metal veins associated with cobalt and red and/or weathered dikes with indeterminate primary composition and dikes from earlier mapping (Clark and Hawley 188, Hawley and Clark, 1973; Hawley and Associates, 1978) in areas not traversed during this study. Dikes are abundan

throughout the Peters and Dutch hills and more widely distributed than represented. In general, the dikes are too narrow to occurately present on a map of this scale. nit is present only as dikes. A large gabbro stock with an extensive hornfels aureole was sampled at Mt. Yenlo in the Yenlo lls (approximately 20 km south of the study area). Unit has porphyritic texture. Whole-rock analyses of these rocks (Pinne d others, 1998b) plot within tonalite and quartz diorite fields on Streckeisen plot. Relict feldspar phenocrysts are up to 2.5 m across and make up approximately 30 percent of the rock volume. Mafic minerals (hornblende and rare clinopyroxene) ar to chlorite, calcite, and opaque minerals. Hornblende separates from the Mt. Yenlo body yielded ⁴⁰Ar/³⁹Ar-plateau age of 10 Ma (this study). The Mt. Yenlo gabbro body has weak copper, arsenic, and gold mineralization (Pinney and others, 1998a) occurring as centimeter-wide veins and disseminated chalcopyrite, arsenopyrite, and pyrrhotite within the associated homfels aureole. No platinum group elements were detected in samples from Mt. Yenlo. However, this unit is the most likely bedrock

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