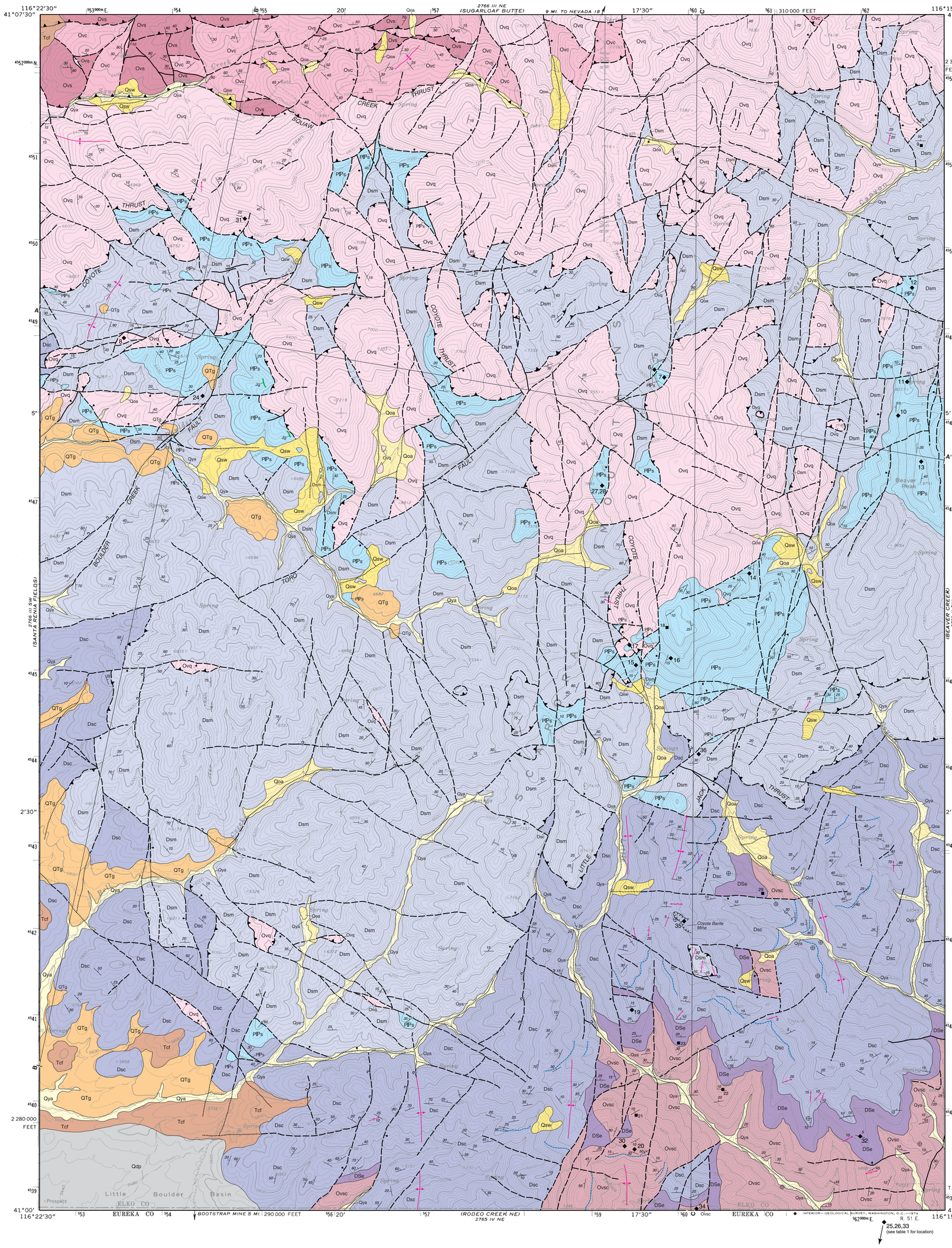
Nevada Bureau of Mines and Geology

Prepared in cooperation with the US Geological Survey

MAP 143 GEOLOGIC MAP OF THE BEAVER PEAK QUADRANGLE, ELKO AND EUREKA COUNTIES, NEVADA



GEOLOGIC MAP OF THE BEAVER PEAK QUADRANGLE, ELKO AND EUREKA COUNTIES, NEVADA

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2003

Qdp **Waste dumps and tailings ponds (Quaternary)** Outer limit of dumps and tailings ponds in general area of Newmont Mining Corporation and Barrick Goldstrike Mines Inc. mining operations as of late 1998.

Qya **Younger alluvium and fanglomerate deposits (Quaternary)** Unconsolidated sand and gravel deposits. Includes some fanglomeratic deposits near lower reaches of major drainages near southern boundary of quadrangle.

Qsw **Slope wash deposits (Quaternary)** Locally include talus deposits.

Qoa **Older alluvium (Quaternary)** Unconsolidated gravel and sand deposits generally present in upper reaches of drainages, commonly comprising raised benches adjacent to present-day active and intermittent streams.

QTg **Gravel deposits (Quaternary and Tertiary)** Present at several different erosion levels. Highest level marked by isolated remnants indicating former presence of fanglomeratic channel along Boulder Creek.

Tcf **Carlin Formation of Regnier (1960) (Miocene)** Includes mostly unconsolidated cobbles and boulders of quartzarenite derived from the Ordovician Vinini Formation, boulders of chert derived from shale and chert unit of Vinini Formation, Devonian Slaven Chert, and Devonian chert mélange unit of Slaven Chert, as well as cobbles and boulders derived from Pennsylvanian and Permian Strathearn Formation, all in sparse sandy to clayey matrix.

Jg **Dikes (Jurassic?)** Two intensely clay-altered felsite dikes that crop out east of Boulder Creek fault where they include monzonite and alkali granite facies comprised either of stubby intergrown laths of clay-clouded plagioclase and K-feldspar or mostly K-feldspar. Weather yellowish white and contain buff- to ochre-colored iron-oxide stains. Poorly exposed in two isolated exposures where dikes are emplaced into pebbly conglomerate of lower strata of Strathearn Formation. Pebbly conglomerate in immediate area of dikes, as well as along a narrow zone elongate to N30°W, shows presence of microveins including quartz, chlorite, and yellowish iron-oxide minerals—possibly including jarosite—that replace sulfide minerals. Chlorite also forms mm-scale halos around microveins. Dikes probably correlate with >147-Ma informally named Arturo dike in the Dee Mine (Theodore and others, 1998).

PIPs **Strathearn Formation of Dott (1955) (Permian and Pennsylvanian)** Generally highly resistant, thick, drab gray brown to reddish brown ledges or rubble strewn slopes of mostly chert-pebble conglomerate similar to overlap assemblage deposits elsewhere in region and derived, in part, from reactivated highlands of Antler orogeny of Roberts and others (1958). Crops out in numerous discontinuous bodies, where underlying rocks primarily are Devonian chert mélange unit in upper plate of Little Jack thrust. Formation also includes rare onlap relations with Devonian Slaven Chert in lower plate of Little Jack thrust. Lower parts of formation are tectonically overlain by tectonic wedge of quartzarenite of Ordovician Vinini Formation floored by the Coyote thrust. Formation includes two prominent horizons of conglomerate that straddle the tectonic wedge. Lower one near base, commonly includes poorly sorted chert and quartzarenite pebble, clast-supported and structureless conglomerate as much as 200 m thick, some including interbedded highly fusulinid-rich lenses of peloidal grainstone (Theodore and others, 2003). This pebble conglomerate is overlain by as much as 30 m of gray to light gray limestone, and approximately 300 m of dolomitic siltstone, including grains of K-feldspar, near top of sequence near Beaver Peak. Upper conglomerate crops out prominently on ridgeline about 3.5 km southwest of Beaver Peak where it onlaps quartzarenite of Vinini Formation in upper plate of Coyote thrust. Matrix of upper conglomerate includes abundant variably rounded monocrystalline quartz grains and quartzarenite fragments derived from underlying quartzarenite. Formation ranges in age from middle Late Pennsylvanian to middle Early Permian (table 1) (see also, Theodore and others, 2000a, 2000b, 2003; Berger and others, 2001).

ALLOCHTHON OF THE ROBERTS MOUNTAINS THRUST

In this area includes allochthon of Little Jack thrust, allochthon of Coyote thrust, and allochthon of Squaw Creek thrust.

Allochthon of Little Jack thrust Present in upper plate of Little Jack thrust and most widely exposed tectonostratigraphic plate in quadrangle. Together with Coyote allochthon and Squaw Creek allochthon, makes up tectonic package of rocks reactivated during the late Paleozoic (see also Roberts and others, 1958; Roberts, 1964; Ketner, 1977). In this area includes:

Dsm **Undivided chert mélange unit of Slaven Chert of Gilluly and Gates (1965) (Devonian)** Commonly ridge-forming rubbly exposures that include chaotic depositional and intensely deformed tectonic fabrics. Unit typically weathers green gray with locally moderate amounts of yellow brown iron oxide. One of the more striking features of unit is absence of continuous bedding surfaces and presence of structurally transposed lithologic layering that yields flat chips whose shapes are controlled by closely-spaced foliation surfaces. Sequences dominated by somewhat more argillaceous chert and shale locally have highly contorted lithologic layering, including presence of numerous slip surfaces on individual outcrops. Such sequences yield broad areas of light gray to tannish gray debris-covered colluvial slopes. Some sequences are intensely rodded. Generally, variably colored millimeter- to centimeter-sized, angular to ovoid chert fragments set in either a chert matrix or ductile argillaceous matrix—some fragments have fabrics suggestive of soft-sediment deformation features. Fragmental nature of unit persists down to microscopic scale. Overall tectonostratigraphic thickness of unit is quite variable, but roughly is as much as 1,400 m thick near north edge of quadrangle in vicinity of Toro fault. Near trace of Little Jack thrust, includes some sequences, as much as 50 to 60 m thick, of mottled gray-green-weathering well-bedded chert probably incorporated structurally into the Little Jack allochthon from underlying unit. Also near Little Jack thrust, rocks are exceptionally altered to clay(s) and other brown, ochre brown, and green brown iron-oxide minerals. Matrix locally includes Devonian radiolaria (table 1), and unit west of area (Theodore and others, 2000a), includes Devonian conodonts in limestone interbed. Unit presumably correlative with Late Devonian sedimentological breccia and barite breccia unit of Slaven Chert in Shoshone Range (C.T. Wrucke, oral commun., 1999) and olistostromal unit above Devonian Scott Canyon Formation at Battle Mountain (Doebrich, 1994).

Dsc **Slaven Chert of Gilluly and Gates (1965) (Devonian)** Generally resistant ridge-forming, homoclinal sequence of commonly north-dipping, relatively thin, gray to black chert beds in rhythmically stratified sequences having mostly 2 to 4 cm between parting surfaces. Rocks characterized by planar bedding surfaces that weather typically to 2- to 5-cm-wide angular fragments. In places, formation is tightly folded along numerous outcrop-scale folds that verge mostly towards southeast. Formation is approximately 700 m thick north of Little Jack Creek where Little Jack thrust forms upper contact. Near southwest corner of quadrangle, includes narrow fault slivers of chert mélange unit. Formation near base locally includes 25- to 30-cm-wide beds of buff-weathering gray dolostone that are interbedded with brown to brownish black chert containing abundant 1.5- to 2.0-cm-wide compaction structures, as well as rip-up mud clasts and other soft-sediment deformation features. Spar dolostone contains abundant regularly sized ooids, approximately 0.1 to 0.3 mm wide. Conodonts obtained from locality near apparent base of formation and near southeast corner of quadrangle include faunule indicative of Lower *Palmatolepis rhenana* Subzone (early late Frasnian) (Late Devonian) (table 1). Palmatolepid-polygnathid biofacies indicates outer shelf or deeper water depositional setting. Well-exposed base of formation near southeast corner of area also shows gradational contact with underlying Silurian and Devonian Elder Sandstone across approximately 10 m of stratigraphic section.

DSe **Elder Sandstone of Gilluly and Gates (1965) (Devonian? and Silurian)** Slope-forming, generally olive gray-green, dolomitic and calcareous siltstone, dolostone, dark gray shale, and minor chert assigned to the Elder Sandstone. Rocks weather to various shades of brown and gray brown. Thickness of formation is approximately 150 m. Forms recessive part of well-exposed homoclinal sequence of formations dipping at shallow angles to north near southeast corner of quadrangle where ridgelines are held up by thick strata of overlying Slaven Chert. Locally also includes some interbeds of chert as well as prominent sequence of chert near base probably correlative with Early Silurian (Llandoverian) Cherry Spring chert of Noble and others (1997) in the northern Adobe Range. Laminae in siltstone are defined by mm-sized, discontinuous, wispy layers that show some weakly developed crossbeds. Siltstone commonly includes 0.03- to 0.04-mm-wide (medium to coarse silt) angular detrital grains of quartz, K-feldspar (roughly 10 to 15 volume percent), white mica, biotite (white mica >> biotite), and opaque minerals. In places, siltstone is partly recrystallized to spar silty dolostone and dolomite is ferroan. Locality near southeast corner of area approximately from middle of well-exposed sequence through formation, yielded more than 30 shale chips containing graptolites—many chips contain several graptolite specimens. Graptolite fauna consist of two species: *Bohemograptus bohemicus* and *Saetograptus willowensis* (table 1), a fauna reported by Berry and Murphy (1975) from middle of the Silurian Roberts Mountains Formation in central Nevada. The fauna is characteristic of the *B. bohemicus* Zone of the late Ludlovian (early Late Silurian). Noble (2000) reported presence of Devonian radiolaria near top of Elder Sandstone, a few kilometers to west at Ren Mine.

See accompanying text for table 1, references, and description of the geologic framework of the Beaver Peak area.

Vinini Formation of Merriam and Anderson (1942) Comprises strata in the upper plate of the Roberts Mountains thrust, in the upper plate of the Coyote thrust, and in the upper plate of the Squaw Creek thrust. In this area consists of:

Ovsc **Shale and chert (Ordovician)** Mostly dark gray to black shale and chert, including some argillite, that crop out near southeast corner of area and comprise basal unit of homoclinal sequence of formations that dip shallowly (10 to 15°) to north. Strata generally slope forming, poorly exposed, and typically include evidence of outcrop-scale structural disruption such as crumpled bedding and cleavage. Locally includes thin (approximately 0.5 m) laminated gray micrite, that weathers light gray to buff gray near top of strata. Gray micrite interbedded with black chert that contains ovoid phosphate-rich clots. Some black micrite, barren of conodonts, directly below contact with overlying siltstone of Elder Sandstone, shows no evidence of structural disruption. Collection of conodonts obtained from locality (map loc. no. 25) at 7,220–foot elevation on ridgetop, long. 116°15'22"W, approximately 600 m south of south border of quadrangle, can be no younger than early Ashgillian (late Late Ordovician) or older than late early Caradocian (early Late Ordovician) (table 1). Two other nearby localities north of Little Jack Creek in Rodeo Creek NE Quadrangle, approximately 1.1 km southwest of southeast corner of area and at approximately 6,000–foot elevation, contain graptolite faunas indicating correlation with the Middle Ordovician *Hustedograptus teretiusculus* Zone (Zone 10 of Berry, 1960) (table 1). Unit also correlates with the lower part of Upper Member of Vinini Formation at type locality at Vinini Creek, Roberts Mountains, approximately 125 km to south.

Allochthon of Coyote thrust Tectonostratigraphic plate that crops out widely throughout northern half of quadrangle in upper plate of Coyote thrust. Together with Little Jack allochthon and Squaw Creek allochthon, makes up tectonic package of rocks reactivated during late Paleozoic Humboldt phase of Antler orogeny (Theodore and others, 1999, 2000a). In this area includes:

Ovq **Quartzarenite (Ordovician)** Resistant, moderately rounded ridges of mostly massive orange-brown- to drab ochre-brown-weathering quartzarenite. Quartzarenite typically mature and made up of medium-grained, well-sorted monocrystalline quartz grains showing size-specific rounding. Includes sparse thin interbeds of green to olive green chert, and other chert possibly caught up along unmapped, minor, steeply dipping normal faults. Near northwest corner of quadrangle includes green and black, thin discontinuous beds of chert that apparently increase in overall abundance downsection and to the northwest. Locally, quartzarenite includes poorly exposed, interbedded gray brown siltstone, fine-grained quartzarenite, and black shaly chert. Unit includes sedimentary and tectonic breccia; latter shows recrystallization of angular quartz matrix among well-rounded quartz grains. Locally dense concentration of planar quartz veins. Gray brown micrite (as much as 1 m thick), in fault sliver east of Boulder Creek, is interbedded with rusty-brick-red weathering siltstone and contains juvenile conodonts that are Caradocian (middle Middle to middle Late Ordovician) (table 1). Shale in green chert interbedded with quartzarenite approximately 30 m above trace of Coyote thrust near northwest corner of quadrangle, west of Boulder Creek, includes *Cryptograptus schaeferi*, *Glossograptus* sp., *Nemagraptus* sp., (?)*Leptograptus*, and *Pseudoclimacograptus* sp. that are uppermost Middle Ordovician (table 1). Quartzarenite commonly is intensely recrystallized to white sucrose hornfels near Coyote thrust. Hornfels near thrust locally contains abundant brick-red iron-oxide minerals and breccia. Quartzarenite intensely lineated by brittle-style striae, in places including widespread slickensides, within 10 m of trace of Coyote thrust. Base of formation not exposed. Apparently correlative with quartzarenite in upper member of Vinini Formation in Roberts Mountains (Finney and others, 2000).

Squaw Creek allochthon Present in upper plate of Squaw Creek thrust and present in areally restricted area near north edge of quadrangle. Together with Coyote and Little Jack allochthons, makes up tectonic package of rocks reactivated during late Paleozoic Humboldt phase of Antler orogeny. In this area includes:

Ovs **Undivided siltstone (Ordovician)** Mostly dark gray-brown poorly exposed, slope-forming siltstone that, in places, weathers yellow ochre. Includes fine-grained sandstone and sparse interbeds of chert.

Ovc **Undivided chert (Ordovician)** Mostly olive gray-green to brown chert. Poorly exposed locally.

Contact Queried where location uncertain.

Fault Normal and high-angle reverse, showing dip where known; bar and ball on downdropped block. Long dashed where approximately located; short dashed where inferred; dotted where concealed; queried where uncertain. Arrows indicate sense of displacement; relative motion in cross section, A, away from observer, T, toward observer.

Thrust fault Teeth on upper plate; showing dip where known; long dashes where approximately located; short dashes where inferred; dotted where concealed; queried where uncertain.

Overturned Thrust fault Teeth on upper plate; dashed where approximately located.

Continuous strata of chert Shows approximate extent along strike.

Dike

Strike and dip of bedding

Inclined — Vertical — Overturned — Horizontal

Folds Showing trend and plunge of axial trace.

Anticline — Syncline

Minor folds Showing trend and plunge of hingeline.

Minor anticline — Horizontal minor anticline — Minor syncline — Minor overturned folds; showing sense of vergence — Horizontal minor overturned fold; showing sense of vergence — Horizontal minor coaxial fold; showing polyclinal senses of vergence

Lineations Brittle style striae and slickinsides showing trend and plunge.

Inclined — Horizontal

Fossil locality Showing map location number keyed to table 1.

Barren locality Showing map location of calcareous strata determined barren of conodonts; keyed to table 1.

Coyote Barite Mine Outer limit open cut

Scale 1:24,000

0 0.5 1 kilometer

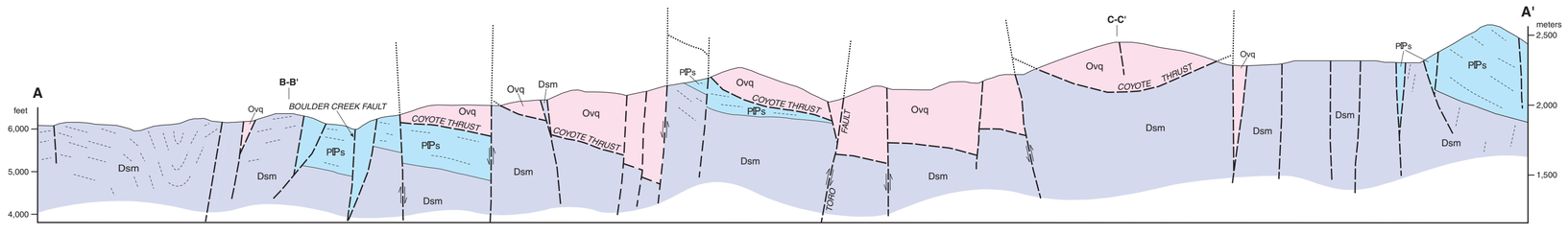
0 0.5 1 mile

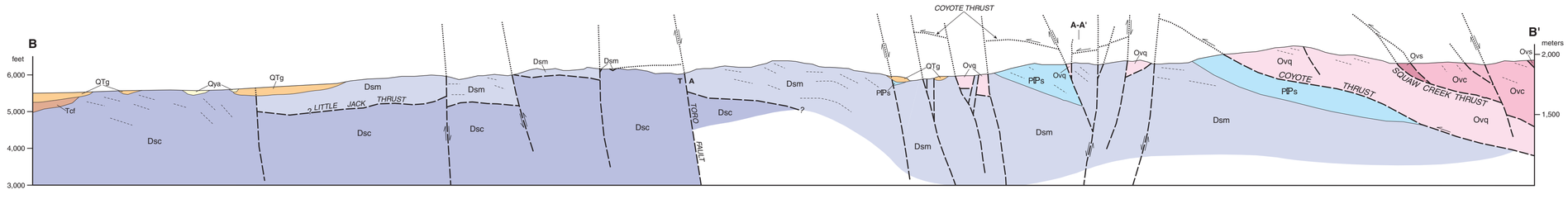
0 1000 2000 3000 4000 5000 feet

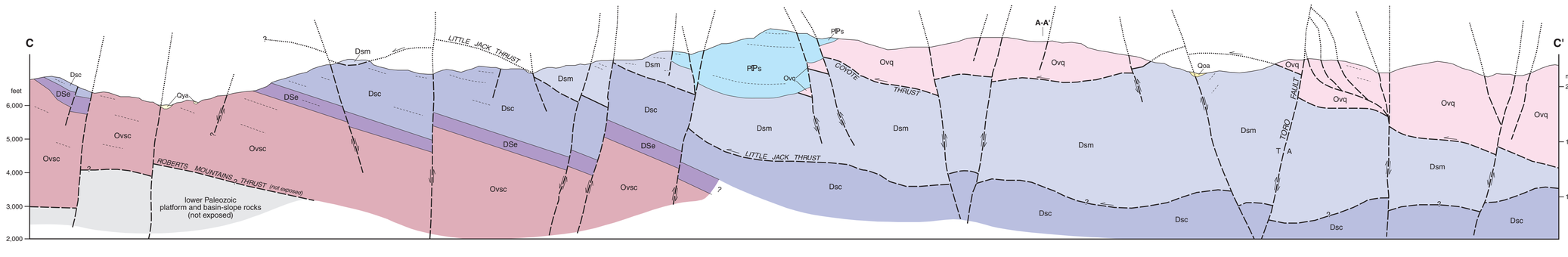
CONTOUR INTERVAL 40 FEET

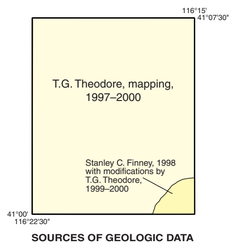
Base map: U.S. Geological Survey Beaver Peak, NV 7.5' Quadrangle, 1970
Projection: Nevada Coordinate System, east zone (transverse Mercator)
1927 North American Datum

Qdp, Qya, Qsw, Qoa		QUARTERNARY
UNCONFORMITY		
QTg		QUARTERNARY AND TERTIARY
UNCONFORMITY		
Tcf	Miocene	TERTIARY
UNCONFORMITY		
Jg		JURASSIC
UNCONFORMITY		
PIPs	Early Permian and Late Pennsylvanian	PERMIAN AND PENNSYLVANIAN
UNCONFORMITY		
ALLOCHTHON OF LITTLE JACK THRUST: Dsm (Base not exposed Little Jack thrust)	Late, Middle, and Early Devonian	DEVONIAN
ALLOCHTHON OF ROBERTS MOUNTAIN THRUST: Dsc, DSe	Early Devonian(?) and Late Silurian	DEVONIAN AND SILURIAN
DISCONFORMITY		
Ovsc (Base not exposed Roberts Mountains thrust (not exposed))	Late and Middle Ordovician	ORDOVICIAN
ALLOCHTHON OF SQUAW CREEK THRUST: Ovs, Ovc (Base not exposed Squaw Creek thrust)		
ALLOCHTHON OF COYOTE THRUST: Ovq (Base not exposed Coyote thrust)		









SOURCES OF GEOLOGIC DATA

Field work performed from 1997–2000.

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