

**New Mexico Bureau of Mines and Mineral Resources
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GEOLOGIC MAP AND SECTIONS

SOUTH BALDY QUADRANGLE

SOCORRO COUNTY, NEW MEXICO

by

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EXPLANATION

Alluvial Deposits

[Qa] Quaternary Alluvium undivided (Cross Sections only).

[Qv] Valley Alluvium (0-50 ft, 15 m) Deposits in active stream channels. Lithologies vary with location depending on slope of stream and surrounding terrain. Low slope areas in this quadrangle predominantly contain moderately well-sorted sandstone and conglomerates whereas higher slope areas have mainly poorly sorted, boulder alluvium.

[Qtg] Valley alluvium isolated above present stream levels, particularly along major canyons.

[Qp] Piedmont Slope Deposits (0-150 ft, 45 m) CONGLOMERATES, SANDSTONES, AND BOULDER ALLUVIUM: Alluvial Fan Deposits consisting of mixed clasts of all major rock types exposed in present highlands. Deposits are coarse (talus and boulder alluvium) on steep mountain fronts but fine rapidly to conglomerates and sandstones as gradients decrease. Deposits are separated into map units based on geomorphic position and soil development (relative age) rather than lithology. Those deposits near present stream levels with little or no soil development mapped as Qpy, older deposits with higher geomorphic position and better developed soils mapped as Qpo.

[Qt] Talus/colluvium. Unconsolidated talus, soil stabilized talus and slope wash.

[Tp] Popotosa Formation [Denny, 1940] (0-3000 ft, 900 m) CONGLOMERATES, SANDSTONES, and BOULDER ALLUVIUM: Alluvial fan deposits filling local structural basins created by normal faulting. Locally interlayered with contemporaneous volcanic rocks. Consists of two sedimentary and several volcanic members within this quadrangle.

[Tpi] MUDFLOW BRECCIAS: (0-500 ft, 150 m) pale reddish brown to grayish red, very well indurated, matrix supported, cobble to boulder alluvium. Proximal alluvial fan deposits containing a variety of volcanic clasts (South Canyon Tuff, and basaltic andesite are particularly abundant) in a very well cemented, sandy matrix. Induration sufficient that fractures cut through rather than around clasts. Directly overlies Lemitar Tuff or overlying andesitic lavas along and near fault scarps and is probably the oldest Popotosa present in this quadrangle. Relationship to unit Ts1, which is interpreted to be in part caldera fill, problematic but units are probably in part age equivalent. Contains clasts of, and is therefore younger than, South Canyon Tuff which marks base of Ts1 but relationship to tuff of Turkey Springs which caps Ts1 is unknown. Dark red colors may relate to K₂O Metasomatism (Chapin and Lindley, 198??).

[Tp] CONGLOMERATES AND SANDSTONES: (0-800 ft, 225 m) dark reddish brown to grayish pink, poorly to well indurated, pebble to cobble conglomerates and coarse grained

sandstones. Contain entirely volcanic clasts derived from local units. Better indurated and coarser in northern exposures. Overlies tuff of Turkey Springs in southwest part of quadrangle; no base is exposed farther north. Overlain by Magdalena Peak Rhyolite here and farther west in the Squaw Peak quadrangle (Donze, 1980) where it is essentially flat lying. The Magdalena Peak Rhyolite appears to cap the Mulligan Gulch depositional basin for the most part and therefore dates the latest Popotosa deposition in the quadrangle at about 14 to 18 m.y.

Volcanic Rocks in Santa Fe Group

[T_{mp}] Magdalena Peak Rhyolite [Allen, 1979] 0-500 ft (0-180m) Rhyolite lava flows: Pink, buff, or gray, flow-banded, moderately porphyritic, rhyolite lavas. Consists of at least two flows locally. Often underlain by light-colored, poorly welded, lithic-rich tuff layers [T_{mtt}]. Contains 10 to 20% total phenocrysts consisting of plagioclase, hornblende, and biotite in most samples. A few samples contain more quartz and sanidine (Bowring, 1980) and may be a different lava flow not separated during this mapping. One sample from this quadrangle dated at 18.0 ± 0.8 m.y. (C. E. Chapin, unpublished data). Overlies Popotosa Formation or rhyolite of McDaniel Tank and is locally overlain by Popotosa Formation.

[T_{mt}] Rhyolite of McDaniel Tank [Donze, 1980] 18.3 ± 0.7 m.y.; 0-400 ft (0-120 m); RHYOLITE LAVA FLOWS. Dense, very phenocryst poor, flow banded rhyolite lava. Flow usually underlain by glassy ash-flow tuff with the same mineralogy [T_{mtt}]. Rock typically contains prominent contorted flow banding on a millimeter scale and very sparse phenocrysts, about 1% plagioclase and minor biotite. Lava usually banded gray or purplish alternating with light gray or white and underlying tuff usually black or black with reddish pumice. Thins abruptly to the east (Sec 3, T. 4 S., R. 4 W.) from a maximum of about 400 ft. Overlies conglomerates of Popotosa Formation. Overlain by Magdalena Peak rhyolite along topographic scarp, probably the eroded edge of the lava flow. Chemically McDaniel Tank is a high silica, high-potassium rhyolite (Bobrow, 1984).

Tertiary ash-flow Tuffs and Regional Lavas

[T_{ts}] Tuff of Turkey Springs [Ferguson, 1986] (0-200 ft, 60 m) 24. ma (W. M. McInosh, unpublished data) ASH-FLOW TUFFS: Phenocryst-poor (base) to moderately phenocryst rich (top) rhyolite ash-flow tuff. Contains 3 to 20 percent phenocrysts of sanidine, quartz with minor plagioclase and traces of biotite, sphene and opaque minerals. Sanidine and quartz are subequal except near base where sanidine is approximately twice as abundant as quartz. Unit very similar in petrography and zoning to outflow South Canyon Tuff. Chemically the Turkey Springs is high-silica rhyolite throughout (Ferguson, 1986).

[T_{s1}] CONGLOMERATES, SANDSTONES, BRECCIAS, TUFFS: (0->800 ft, 260 m) Volcaniclastic rocks of diverse characteristics above South Canyon Tuff and usually overlain by Tuff of Turkey Springs. Northern exposures near Deer Plot Tank are moderately indurated, finely laminated sandstones and siltstones with occasional cobbles. More southerly exposures are mostly pebble and cobble conglomerates and are interlayered with basaltic

andesite lavas. Those near south map boundary are dark red, highly indurated and fairly coarse. 1 mile to northwest conglomerates are finer and moderately indurated except near small rhyolite intrusions where they are strongly silicified. Pumiceous unwelded to poorly welded tuffs, perhaps ignimbrites, are present near middle of unit in sections 3 and 10 T5S, R4W. At southern map boundary Ts1 pinches out eastward and Turkey Springs directly overlies South Canyon Tuff. This pinch out together with presence of erosional unconformity beneath South Canyon in southwest quadrant of map suggest that this is the eastern topographic margin of Mount Withington cauldron and that Ts1 sediments are caldera fill equivalent to unit of East Red Canyon in east-central San Mateo Mountains (Ferguson, 1986).

[Tsc] South Canyon Tuff 27.36 Ma* (0-650 ft, 200 m) ASH-FLOW TUFFS: Simple to compound cooling unit of reddish brown, pumiceous, quartz-rich, rhyolite ash-flow tuff. Usually mapped as lower phenocryst-poor (3 to 5%) and upper moderately phenocryst rich (15-25%) members divided at an abrupt upward increase in phenocryst content. Both members contain subequal chatoyant sanidine and euhedral quartz phenocrysts with trace amounts of plagioclase, biotite, sphene, and zircon. Locally beds with more abundant sanidine and less quartz are present at the top of the upper member. South Canyon lies on an erosional unconformity in this area and most, if not all, exposures are upper member. These exposures are thought to lie on the west facing eastern topographic margin of the Mount Withington cauldron. The major outcrop areas in the west-central part of map were originally correlated with upper Lemitar Tuff (Donze, 1981, Bowring, 1980) and have not been remapped since incorrect correlation was discovered. Small amounts of Lemitar Tuff could conceivably be included here.

[Th] Unit of Hardy Ridge: RHYOLITE LAVA FLOWS, BASALTIC ANDESITE LAVAS, DACITIC LAVAS, RHYOLITIC TUFFS: Several lithologies are present between Lemitar and South Canyon Tuffs. Phenocryst-poor rhyolites dominate volumetrically. Unit overlies Lemitar Tuff at north and south end of exposures and Caronita Canyon Tuff in between where Lemitar Tuff has been eroded. South Canyon Tuff caps some exposures but others are unconstrained except by lithologic similarity.

[Thba] MAFIC LAVA FLOWS: (0-300 ft, 90 m) brownish-gray to grayish-red, aphanitic to slightly porphyritic, vesicular basaltic andesite lavas. Contain trace to 20 percent relict pyroxene and olivine phenocrysts and sometimes one to few percent plagioclase phenocrysts. Similar to basaltic andesite lavas found throughout the area at many stratigraphic levels. Occurs at several stratigraphic levels within Unit of Hardy Ridge including between Thr and Thr1, above Lemitar Tuff, above Caronita Canyon Tuff and below Lemitar Tuff and both above and below [Tilt].

[Til] DACITIC LAVAS: (0-400 ft, 130 m) Porphyritic, intermediate composition lavas. Two varieties are present. On South Baldy (Sec 7, T4S, R3W) a lava occurs which contains 20 to 25 percent of alkali feldspar, quartz, relict pyroxene and magnetite. Farther west (Sec 22, 23, T4S, R4W) other lavas contain about 30% phenocrysts of plagioclase, quartz, potassium feldspar, relict amphibole, biotite and magnetite in a matrix composed

primarily of plagioclase microlites.

[Tilt] ASH-FLOW TUFFS and VOLCANICLASTIC SEDIMENTS: (0-200 ft, 60 m) Sequence of poorly welded, lithic-rich, ash-flow tuff, laharic breccias, and volcaniclastic conglomerates and sandstones. Ash-Flow Tuffs contain 10 to 15 % phenocrysts of quartz, plagioclase and sanidine. Sediments contain fragments of basaltic andesite, phenocryst-poor rhyolite lavas and upper Lemitar Tuff or Caronita Canyon Tuff.

[Thr1] RHYOLITE LAVAS: (0-1100 ft, 350 m) Light-gray to pink, aphanitic, flow banded rhyolite lava flows. Contain no phenocrysts or traces of quartz, and sanidine phenocrysts in aphanitic to spherulitic groundmass. Lava typically contains conspicuous subspherical spherulites to several inches across that weather out of the enclosing lava. Includes rhyolite of Sawmill Canyon of Roth (1980). Lavas underlain in some places by light-colored, pumiceous, poorly welded, lithic-rich tuffs [Thr1t] and pyroclastic breccias. Contain abundant lithic fragments of aphanitic andesites and ash-flow tuffs, probably Lemitar Tuff. Tuffs locally injected into fault planes along Sawmill Canyon (Roth, 1980). Tuffs are thought to be tuff cone deposits under edge of dome where approximately flat lying and a pyroclastic selvage around intrusive neck where contact crosscutting.

[Thr] RHYOLITE LAVA FLOWS: (0-800 ft, 260 m) light gray to pinkish gray, phenocryst-poor rhyolite lavas. Slightly flow banded and contains spherulites in hand sample. Contains 1 to 4% phenocrysts of sanidine and quartz in subequal amounts. Overlies Caronita Canyon Tuff in western most exposures in this quadrangle and is overlain by [Thr1].

[TI] Lemitar Tuff 27.97 Ma* (500 to 1800 ft, 500 m) ASH-FLOW TUFFS: Complexly zoned, simple to compound cooling unit of ash-flow tuff. Unit consisting of lower, moderately phenocryst poor rhyolite which grades upward into a plagioclase- and biotite-rich dacite which in turn grades upward into a phenocryst-rich, sanidine-and quartz-rich upper rhyolite. Zones persist throughout outflow distribution area. Divided into two mapping units at abrupt upward increase in phenocryst content which corresponds to boundary between lower rhyolite and dacite intervals.

[Tlu]Upper Member --(0-800 ft, 250 m) medium-red to light-yellowish-gray, phenocryst-rich ash-flow tuff. Lower portion of dark red to reddish gray, plagioclase- and biotite-rich dacite contains about 25 to 35 percent total phenocrysts consisting of plagioclase, biotite, hornblende, and sanidine. Traces of quartz, pyroxene, and zircon are also present. Quartz and sanidine gradationally increase at the expense of plagioclase and ferromags beginning about 100 ft above base of member. Top of upper member is a phenocryst-rich rhyolite containing 35 to 50 percent phenocrysts of sanidine, quartz, plagioclase, and biotite. Rhyolite commonly contains large red dacitic clots (to 3 ft long) similar to lower dacitic interval.

[Tll] Lower member -- (0-500 ft, 150 m) Light-gray to pale-red, moderately phenocryst-poor, homogeneous rhyolite ash-flow tuffs. Contains 5 to 15% sanidine, quartz and biotite and traces of plagioclase, sphene, and magnetite. Commonly containing a lithophysal zone near

the middle.

[Txc] Tuff of Caronita Canyon 27.85 Ma* [Petty, 1979] (0-2200 ft, 660 m) ASH-FLOW TUFFS: Strongly zoned, simple to compound cooling unit of ash-flow tuff. Divided into two members at sharply gradational upward increase in phenocryst content and change from dacitic to rhyolitic mineralogy. Upper rhyolite commonly has numerous flow boundaries on meter or 10's of meter scale marked by thin crystal sand layers, probably surge deposits. Upper member thickest (>1500 ft, 450 m) on Hardy Ridge and along Puertecito Canyon in southwest part of map. This area is interpreted to be the subsided block of Caronita Canyon source cauldron. Caronita Canyon is strongly zoned chemically following a pattern very similar to Lemitar Tuff. Lowest phenocryst-poor, high-silica rhyolite interval, grades upward to moderately porphyritic dacite in the middle. The dacite in turn abruptly grades upward into a very porphyritic rhyolite (Fielder, 1987). Boundary between two members mapped at transition from dacite to rhyolite which corresponds to change from moderately phenocryst poor to very phenocryst rich.

[Txcu] Upper member: White to medium gray, crystal-rich, moderately to densely welded tuff. Contains 30 to 50 percent phenocrysts of sanidine, quartz, biotite and minor magnetite and plagioclase. Quartz is often large and prominently dipyrmidal. Flow boundaries are prominent in many exposures on meter to 10's of meters scale. These often include a few inches of crystal sand, probably surge deposits. Similar to uppermost Lemitar Tuff but units can be distinguished by distinctive lower members.

[Txcl] Lower member: Brown to reddish, moderately crystal-poor, poorly to densely welded ash-flow tuffs. Most of unit contain 5 to 20 percent phenocrysts of plagioclase, biotite, magnetite, and traces of clinopyroxene, quartz and sanidine. Chemically it is a dacite. Basal layers typically are poorly welded and crop out poorly. Where exposed they contain a few percent quartz and sanidine and chemically are high-silica rhyolite. Black vitrophyre locally present at base.

[Tvp] Vicks Peak Tuff 28.46 Ma* [Deal and Rhodes, 1976] (0 ft, 0 m) ASH-FLOW TUFFS: gray to purple gray, poorly to densely welded tuff containing large partially collapsed pumice which commonly have large vapor phase crystals replacing interior. Recognized by porcelaneous texture and low phenocryst content through most of unit (trace of sanidine and quartz). Top may contain as much as 10 percent sanidine and minor pyroxene and quartz phenocrysts. Unit not recognized in this quadrangle but present in adjacent surrounding quadrangles. Elevated rim of Sawmill Canyon-Magdalena cauldron believed to have excluded Vicks Peak ash-flows from this area, although one of several unwelded tuff intervals within Sawmill Canyon Formation might be unrecognized Vicks Peak.

[Tj] La Jencia Tuff 28.78 Ma* [Osburn and Chapin, 1983a] (>3000 ft, 900 m intracauldron) ASH-FLOW TUFFS: Densely welded, crystal-poor tuff containing 1 to 10 percent sanidine, with minor rounded quartz phenocrysts and traces of plagioclase, biotite and magnetite. Usually light-pinkish-gray to lavender in color and commonly densely welded. Base of unit not exposed except where it onlaps large rhyolite dome [Thr₂]. All except uppermost interval usually has strongly lineated pumice and flow folds. Dips are often inconsistent. Locally in

cauldron a thin, upper cooling unit [Tju] is present which contains more abundant phenocrysts and relatively more quartz than is normal. Similar quartz-rich tuff occurs as lenses within the upper parts of La Jencia Tuff in the southern Chupadera Mountains to the east (Eggleston, 1982). Huge megabreccia blocks [Tjm] (10's to 100's meters) within intracauldron La Jencia consist of older andesitic lavas, ash-flow tuffs, and sandstones (see Bowring, 1980).

[Thm] Hells Mesa Tuff: 32.04 Ma* [Chapin, 1974] (>1600 ft, 500 m intracauldron) ASH-FLOW TUFFS: Simple to compound cooling unit of crystal-rich quartz-rich rhyolite ash-flow tuff. Contains 25 to 50 percent phenocrysts of sanidine, plagioclase, quartz, biotite, and hornblende. Pink to reddish-brown when fresh and densely welded, gray when poorly welded or propylitically altered as in most outcrops within this quadrangle. Lithic-rich zones and meter scale exotic blocks common in southern exposures. Large andesite exposure within Hells Mesa may be megabreccia block.

Datil Group

Spears Formation

[Tspu] (~500 ft, 150 m) ANDESITIC AND DACITIC LAVAS, VOLCANICLASTIC MUDFLOW BRECCIAS: Plagioclase porphyritic andesitic lavas, plagioclase and sanidine porphyritic dacite lava and volcanoclastic conglomerates/ breccias undivided.

[Tgm] Tuff of Granite Mountain (~500 ft, 150 m) ASH-FLOW TUFFS: Pumiceous, moderate to densely welded, phenocryst-rich, lithic-rich, dacitic ash-flow tuff. Contains 40 to 50% phenocrysts consisting of plagioclase, sanidine, biotite, magnetite, quartz, and traces of pyroxene. Rocks are strongly propylitically altered and phenocrysts are often difficult to identify positively.

[Tspm] (~500 ft, 150 m) PORPHYRITIC ANDESITE LAVAS: Poorly exposed, porphyritic to very porphyritic ("turkey track") strongly altered, amygdaloidal, andesitic lava flows. Usually contain about 30% plagioclase phenocrysts and about 5% ferromag phenocrysts in a trachytic groundmass. Rocks are usually altered to gray green colors typical of propylitic alteration and phenocrysts are often strongly replaced by chlorite, sericite, clays and iron oxide, often beyond recognition. Phenocrysts vary in size from small to large (>1 cm) but are usually consistent in a single specimen.

[Tspl] CONGLOMERATES, BRECCIAS, SANDSTONES: Andesitic volcanoclastic sediments, probably proximal alluvial fan deposits around central vent volcanos. Cross section only.

[P] Paleozoic Rocks -- Pennsylvanian Madera and Sandia Formation, Mississippian Kelly Limestone and Caloso Formation. In cross-section only.

[pC] Precambrian rocks undivided.

Cauldron-Fill Units

[Tx] Sawmill Canyon Formation [Osburn and Chapin, 1983a] (0-2500 ft, 750 m) ANDESITE LAVAS, RHYOLITE LAVAS, ASH-FLOW TUFFS, CONGLOMERATES, AND MUDFLOW DEPOSITS: Heterolithic fill of Sawmill Canyon Cauldron. Delimited by underlying La Jencia Tuff and overlying Caronita Canyon Tuff or in its absence Lemitar Tuff. In northern part of cauldron, consists largely of andesitic lavas and interbedded debris-flow deposits. To south, andesitic lavas interfinger with rhyolite lavas and volcanoclastic sediments. Formation separated into several members by lithology.

[Txrp] PORPHYRITIC RHYOLITE LAVAS (0-2000 ft, 600 m): Brown to pinkish-gray, locally flow banded rhyolitic lavas containing 5 to 25 percent phenocrysts of sanidine, quartz, and minor magnetite and biotite. Usually contains one to several percent brownish-gray andesitic lithic fragments. Locally underlain by tuff of similar lithology [Txrpt]

[Txr] CRYSTAL-POOR RHYOLITIC LAVAS AND DOMES (0-1000 ft, 300 m): Fine-grained, pink, gray or brown, crystal-poor to crystal-free, flow banded rhyolitic lavas. Unit consists of lava flows along Ryan Hill Canyon and intrusive plugs in southwest corner of map. Lavas locally overlie minor tuffs of similar lithology [Txrt].

[Txa] ANDESITIC LAVAS (0-500 ft, 150 m) Porphyritic to aphanitic mafic lavas at several levels within Sawmill Canyon Formation. To north along Sixmile Canyon comprise most of unit. Farther south thin flow separate thicker silicic members. Except at north, lavas mostly fine grained and similar to La Jara Peak Basaltic andesite.

[Txs] MUDFLOW DEPOSITS, CONGLOMERATES, AND SANDSTONES (0-650 ft, 200 m): Reddish to brown, well-indurated sedimentary rocks. Forms thick intervals along southern cauldron margin and as thin intervals between thicker rhyolitic units to north. Sedimentary deposits similar to lower Popotosa Formation in lithology except clasts restricted to older units. Mostly coarse conglomerates with lesser interlayers of sandstones. Clasts are predominantly rhyolitic lavas, andesites from Luis Lopez Formation, and locally some Hells Mesa Tuff.

[Tz] Luis Lopez Formation [Chamberlin, 1980] (0-2000 ft, 600 m) RHYOLITE LAVAS MAFIC LAVAS, ASH-FLOW TUFFS, AND SEDIMENTARY ROCKS: Heterogeneous fill of the Socorro cauldron. Occurs between underlying intracauldron Hells Mesa Tuff and overlying La Jencia Tuff. Only one rhyolite dome exposed at surface in this quadrangle. Shown undifferentiated in cross sections.

[Tzr₂] RHYOLITIC LAVAS (0-1000 ft, 300 m): Crystal-poor, white, tan or red rhyolitic lavas which contain traces of sanidine and quartz phenocrysts. Exposure is rhyolite dome overlain by maximum of few meters volcanoclastic sediments and then intracauldron La Jencia Tuff. No direct relationship to Hells Mesa or other Luis Lopez rocks exposed.

Intrusive Rocks

[Tra] APHANITIC DIKES AND PLUGS: Fine-grained, phenocryst-poor rhyolitic

intrusions. Typically light colored, and contain no phenocrysts visible in hand sample or sparse small phenocryst of quartz and sanidine. Usually gray or pink and complexly flow banded on millimeter scale. Often accompanied by light colored, lithic-rich pyroclastic breccias [Tra] of similar lithology. Includes several intrusive bodies which may not all be of same age. See map for cross cutting relationships. These are similar in lithology to Txr1 and Thr1 but younger.

[Tir] INTRUSIVE RHYOLITE: Aphyric to fine-grained, light gray, porphyritic rhyolite plugs. Contain 10 to 50 percent phenocrysts of feldspar, quartz, and biotite in fine grained groundmass. Most porphyritic variety resembles upper Caronita Canyon Tuff but unit is demonstrably younger than Lemitar Tuff.

[Tid] Dacite of Deer Plot Tank [Bowring, 1980] INTRUSIVE DACITE PLUGS: Pale red purple, porphyritic dacite? lavas. Contain 10 to 20 % phenocrysts of plagioclase, quartz, and biotite. Hydrothermally altered throughout. Plagioclase often gone or severely corroded and replaced with clay minerals. Groundmass replaced by clay and silica. Biotite is fresh and secondary small biotite crystals present in plagioclase molds. Probably rhyolite chemically. Analogous mineralogy lavas such as rhyolite of Magdalena Peak are rhyolites despite plagioclase and biotite dominated phenocrysts.

[Twr] RHYOLITE DIKES AND SMALL PLUGS: Thin dikes and small plugs of moderately porphyritic to aphanitic rhyolite. Most are bleached to light gray or white color by hydrothermal alteration. Most are probably genetically related to larger Tra or Tir intrusive bodies.

[Tlm] PORPHYRITIC MONZONITE DIKES: Small, coarsely porphyritic altered monzonite dikes. Contain 25 to 30 % phenocrysts of sanidine, plagioclase, quartz, and biotite. Feldspar forms large conspicuous megacrysts, particularly the sanidine which may reach 5 cm in length. Chlorite in the groundmass and mafic minerals often gives the dikes a greenish color.

[Tmi] MAFIC DIKES: Thin (<20 ft, 6m) fine-grained, dark gray dikes. Dikes along Sixmile Canyon similar to La Jara Peak Basaltic Andesite in lithology, One dike along Madera Canyon similar to basalt of Madera Canyon.

- Allen, Phillip R., 198-, Geology of the Magdalena Peak area, Socorro County New Mexico: M.S. thesis, New Mexico Institute of Mining and Technology, pp.
- Bobrow, D.J., 1984, Geochemistry and petrology of Miocene silicic lavas in the Socorro-Magdalena area, New Mexico: M.S. thesis, New Mexico Institute of Mining and Technology, 145 pp.
- Bowring, S.A., 1980, The geology of the west-central Magdalena Mountains, Socorro County, New Mexico: M.S. thesis, New Mexico Institute of Mining and Technology, 127 pp.
- Chapin, C. E., 1971, K-Ar age of the La Jara Peak Andesite and its possible significance to mineral exploration in the Magdalena mining district, New Mexico: *Isochron*, West, no 2, pp. 43-44.
- Chapin and Lindley, 198 ,
- Deal, E. E., and Rhodes, R. C., 1976, Volcano-tectonic structures in the San Mateo Mountains, Socorro County, New Mexico; *in* Elson, W. E., and Northrop, S. A. (eds.), *Cenozoic Volcanism in Southwestern New Mexico*: New Mexico Geological Society, Special Publication 5, pp. 51-56.
- Denny, C.S., 1940, Tertiary geology of the San Acacia area, New Mexico: *Journal of Geology*, v. 48, p. 73-106.
- Donze, Martin A., 1980, Geology of the Squaw Peak Area, Socorro County, New Mexico: M.S. thesis, New Mexico Institute of Mining and Technology, pp.
- Eggleston, T., 1982, Geology of the central Chupadera Mountains, Socorro County, New Mexico: M.S. thesis, New Mexico Institute of Mining and Technology, 164 pp.
- Ferguson, C.A., 1986, Geology of the east-central San Mateo Mountains, Socorro County, New Mexico: New Mexico Bureau of Mines and Mineral Resources, Open-File Report 252, 124 pp.
- Fielder, D. , 1987,
- Kedzie, L.L., 1984, High-precision $^{40}\text{Ar}/^{39}\text{Ar}$ dating of major ash-flow tuff sheets, Socorro, New Mexico: M.S. thesis, New Mexico Institute of Mining and Technology, 197 pp.
- McIntosh, W.C., Sutter, J.L., Chapin, C.E., Osburn, G.R., and Ratte, J.C., 1986, A stratigraphic framework for the eastern Mogollon-Detail volcanic field based on paleomagnetism and high precision $^{40}\text{Ar}/^{39}\text{Ar}$ dating of ignimbrites--a progress report: *New Mexico Geological Society Guidebook 37th Field Conference*, p. 183-196.
- Osburn, G.R., and Chapin, C.E., 1983a, Stratigraphic nomenclature for Cenozoic rocks of the northeastern Mogollon-Datil volcanic field, New Mexico: New Mexico Bureau of Mines


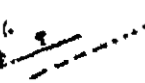
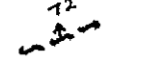
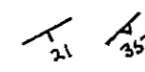
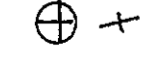






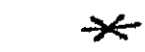
and Mineral Resources, Stratigraphic Chart I.

Osburn, G.R., and Chapin, C.E., 1983b, Ash-flow tuffs and cauldrons in the northeast Mogollon-Datil volcanic field: A Summary: New Mexico Geological Society, Guidebook 34th Field Conference, p. 197-204.

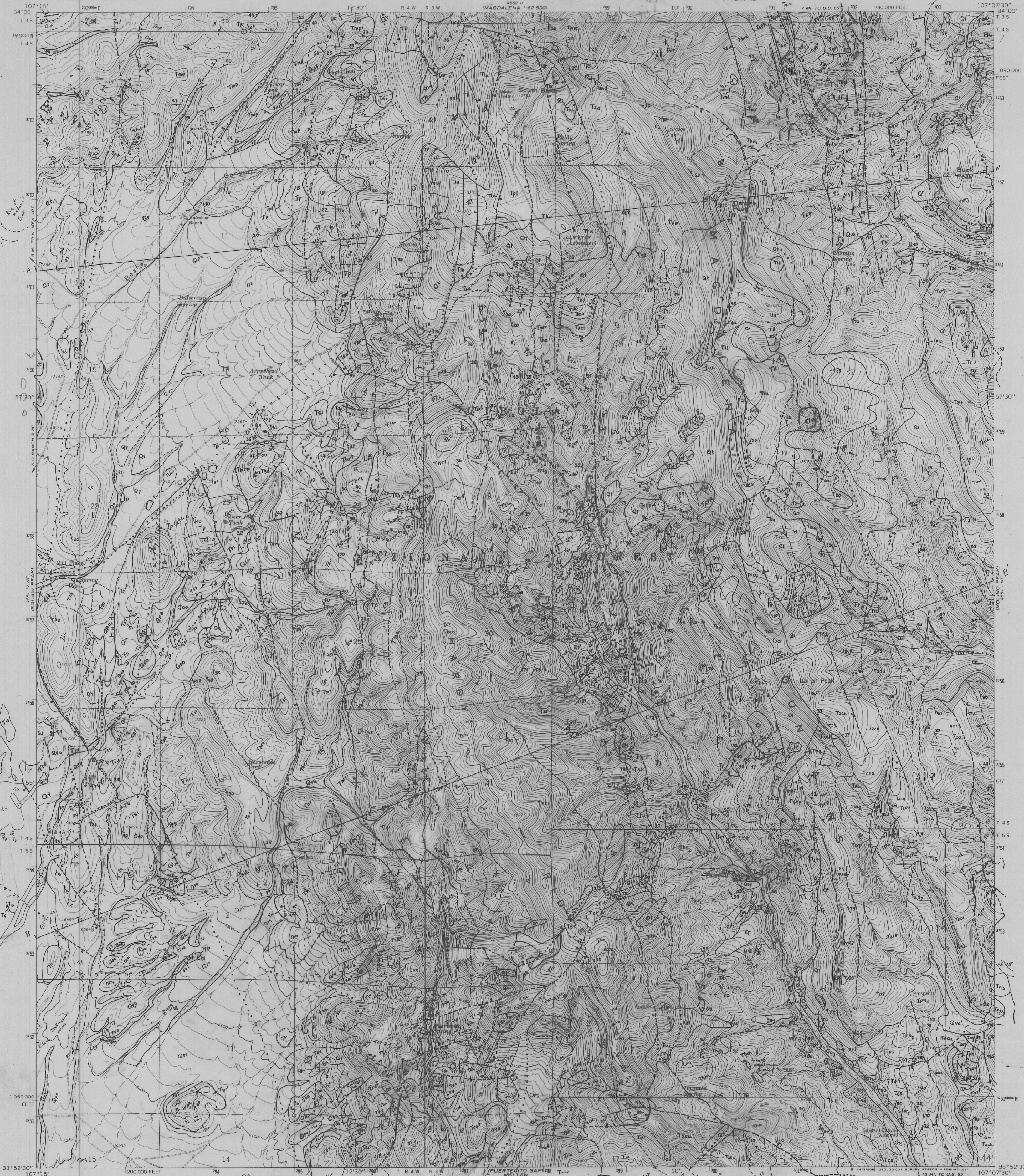
Petty, D.M., 1979, Geology of the southeastern Magdalena Mountains, Socorro County, New Mexico: M.S. thesis, New Mexico Institute of Mining and Technology, 163 pp.

Roth, S.J., 1980, Geology of the Sawmill Canyon area, Magdalena Mountains, Socorro County, New Mexico: M.S. thesis, New Mexico Institute of Mining and Technology, 88 pp.

SYMBOLS

-  geologic contact, dashed where approximate
-  fault, dashed where approximate, dotted where covered, bar and ball on downthrown block, arrow and number give dip direction and angle of fault plane.
-  Shear Zone with No Provable Stratigraphic Offset
-  strike and dip of bedding or compaction foliation in ash-flow tuffs
-  horizontal and vertical bedding
-  strike and dip of flow foliation in lavas and intrusions, horizontal and vertical foliation
-  Flow Lamination in Flow-Banded Lavas and Ash-Flow Tuffs
-  transport direction in conglomerates (based on pebble imbrications)
-  adit
-  prospect pit or bulldozer trench
-  open pit excavation
-  volcanic vent or inferred volcanic vent

*date from McIntosh and others, (1986), includes dates from Kedzie, (1984)

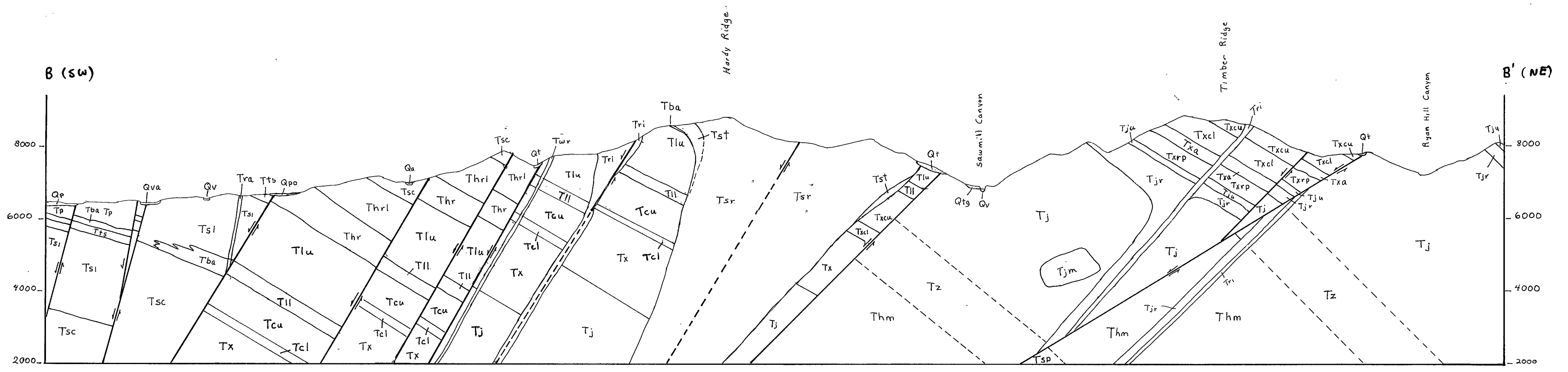


Mapped, edited, and published by the Geological Survey
Control by USGS and USC&GS
Topography by photogrammetric methods from aerial
photographs taken 1964. Field checked 1965
Polyconic projection, 1927 North American datum
10,000-foot grid based on New Mexico coordinate system,
central zone
1000-meter Universal Transverse Mercator grid ticks,
zone 13, shown in blue
Fine red dashed lines indicate selected fence lines
Where omitted, land lines have not been established
To place on the predicted North American Datum 1983
move the projection lines 4 meters south and
53 meters east as shown by dashed corner ticks

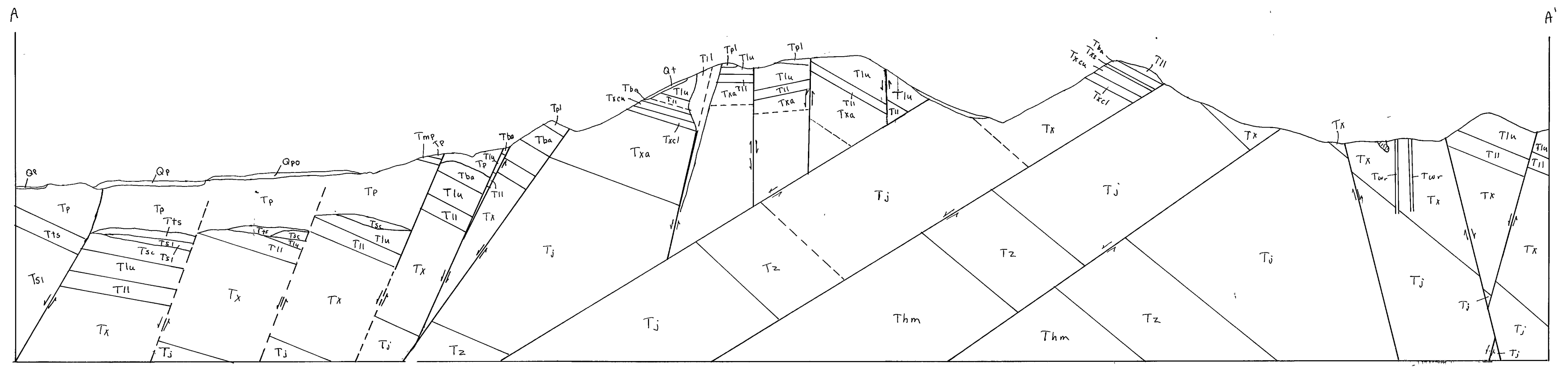
UTM GRID AND 1965 MAGNETIC NORTH
DECLINATION AT CENTER OF SHEET
There may be private inholdings within the boundaries of
the National or State reservations shown on this map

SCALE 1:24,000
CONTOUR INTERVAL 40 FEET
NATIONAL GEODETIC VERTICAL DATUM OF 1929
THIS MAP COMPLIES WITH NATIONAL MAP ACCURACY STANDARDS
FOR SALE BY U. S. GEOLOGICAL SURVEY, DENVER, COLORADO 80225, OR RESTON, VIRGINIA 22092
A FOLDER DESCRIBING TOPOGRAPHIC MAPS AND SYMBOLS IS AVAILABLE ON REQUEST

ROAD CLASSIFICATION
Light-duty ———— Unimproved dirt - - - - -
NEW MEXICO
QUADRANGLE LOCATION
SOUTH BALDY, N. MEX.
N3352.5-W10707.5/7.5
1965
DMA 4551 NW-SERIES V881



Looking NW, no vertical exaggeration



Looking North, no vertical exaggeration

Plate 2: Geological Cross Sections, South Baldy Quadrangle
Osburn and others,