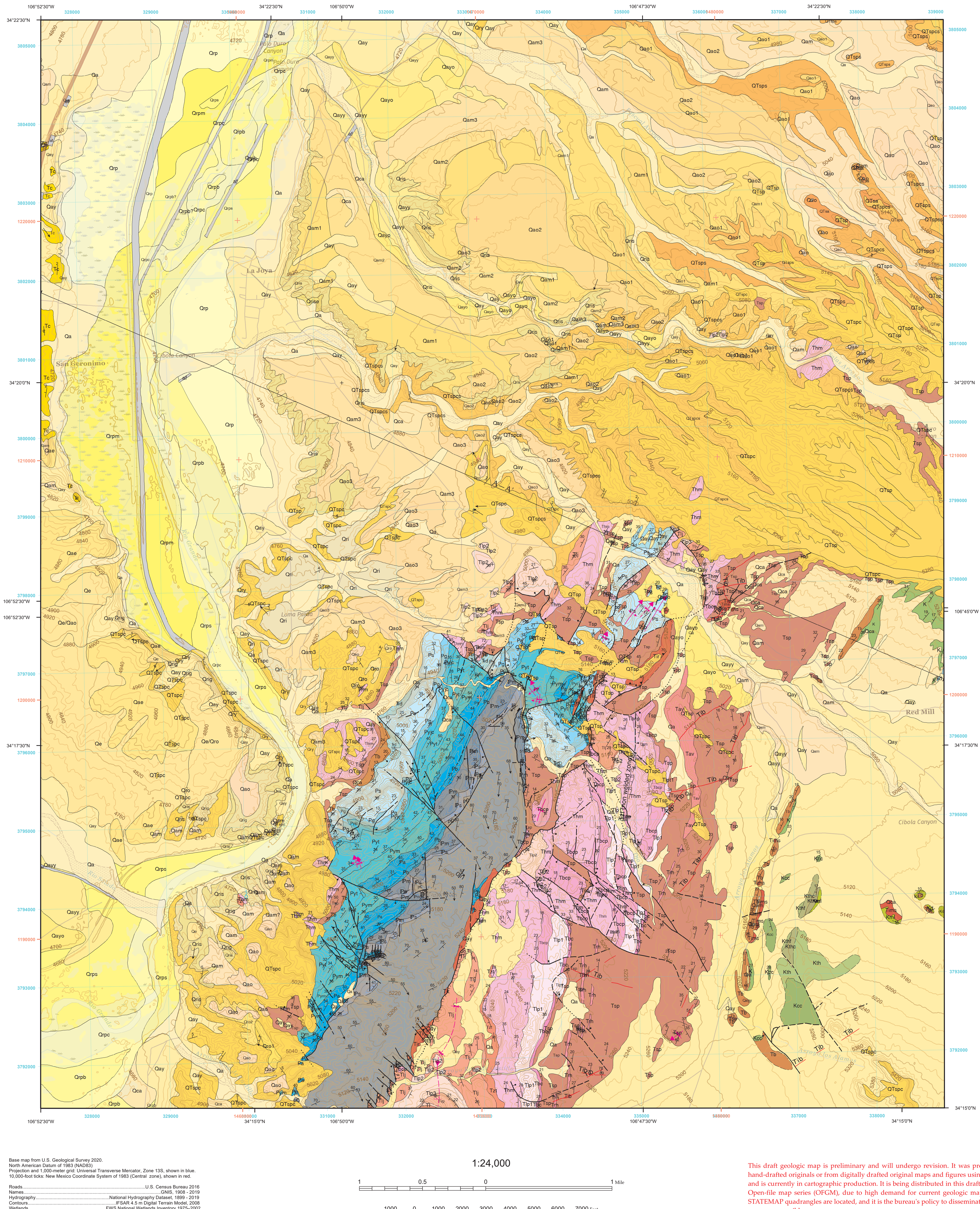
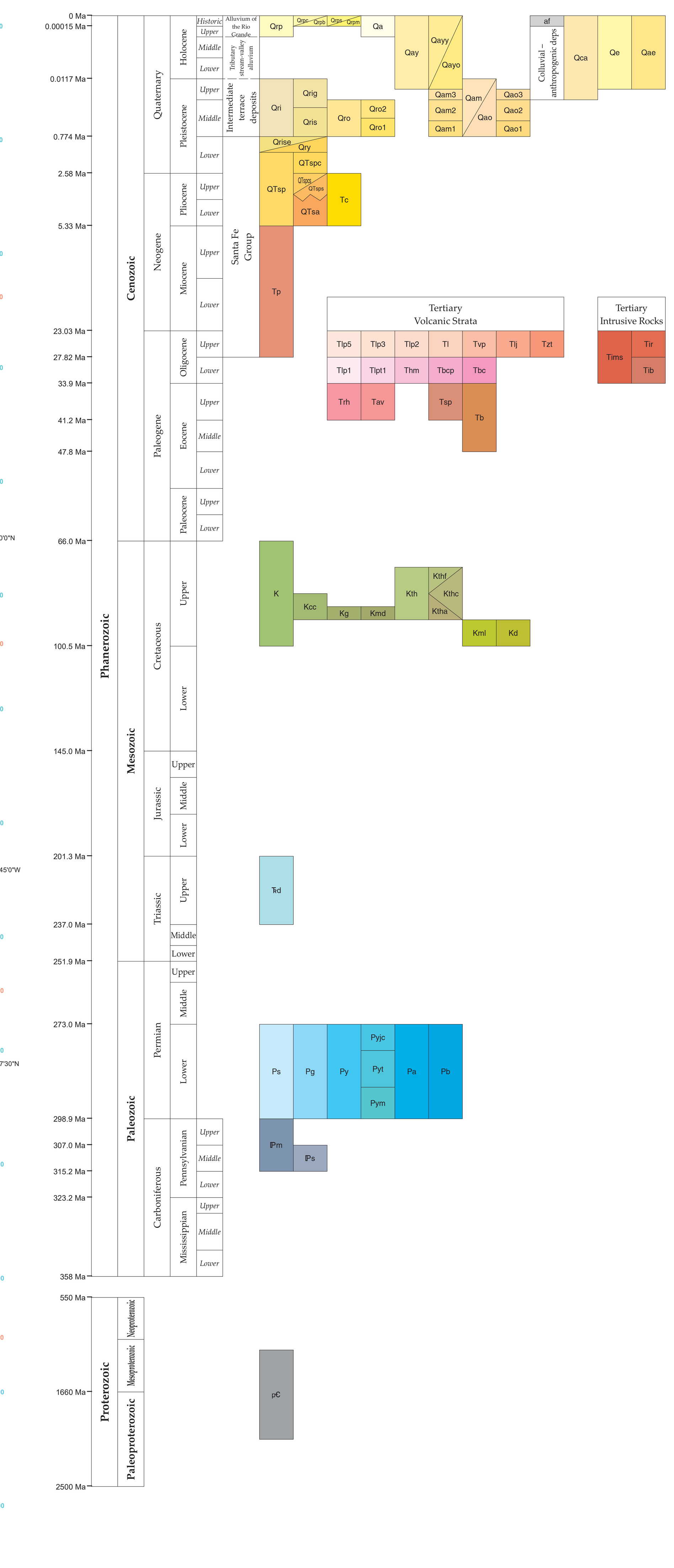


Correlation of Map Units



Description of Map

01-01-01-00-00 — unit — Qrp — Rio Grande alluvium, undivided — Unconsolidated to poorly consolidated coarse-grained sand and gravel with lensoidal interbeds of fine-grained sand, silt, and clay. Forms the lowest inset fluvial deposit of the inner valley and floodplain of the Rio Grande. Locally divided into channel (Qrpc) facies from available aerial photography. Base not exposed but lithologic data from a drill-hole about 8 km southwest of the map area (Section 36, T1S, RW, Lemitar 7.5-minute quadrangle) indicates about 24 m of sand and gravel (Borehole DW-2-1(b), (Hawley and Whitworth, 1996)). The Rio Grande floodplain alluvium is divided into four subunits based on aerial photographic work of Pearce and Kelson (2004) using 1935-vintage aerial photographs, and aerial photographic analysis using 1996-vintage photographs in this study.

01-01-01-01-00 — subunit — Qrpc — Modern channel facies — Unconsolidated sand and gravel within the active channel of the Rio Grande. Generally corresponds to unit W35 of Pearce and Kelson (2004).

01-01-01-02-00 — subunit — Qrpb — Instream-bar deposits — Sand and gravely sand forming instream depositional bars and islands. Corresponds to unit Rib of Pearce and Kelson (2004).

01-01-01-03-00 — subunit — Qrpm — Meander-bend deposits — Deposits preserved along abandoned and active meander bends. Corresponds to unit Rcs of Pearce and Kelson (2004).

01-01-01-04-00 — subunit — Qrps — Scroll-bar deposits — Sand and gravelly sand forming depositional bars. Corresponds to unit Rsb of Pearce and Kelson (2004).

01-01-02-00-00 — unit — Qry — Rio Grande alluvium, terrace deposits — Very pale-brown (10YR 7/3), poorly consolidated, medium- to very coarse-grained sand with scattered pebbly sand beds. Inset against older Rio Grande terrace deposits and represents lowest preserved terrace deposit. Forms discontinuous low-lying terrace along margin of modern Rio Grande Valley. Unit is commonly overlain by younger and intermediate stream- valley alluvium. Base is not exposed, but unit is at least 6 m thick.

01-02-01-00-00 — unit — Qri — Rio Grande alluvium, undivided intermediate — Rio Grande alluvium, undivided intermediate; includes Qrig, Qris, and Qrise.

01-02-02-00-00 — unit — Qrig — Rio Grande alluvium, intermediate terrace gravel — White to pale-brown (10YR 8/2-8/3), poorly consolidated, moderately sorted, pebbly to cobbly sand. Unconformably overlies slightly tilted conglomerate of unit QTsp. Contains abundant rounded orthoquartzite and polished chert pebbles and cobbles with very sparse rounded obsidian pebbles. Also contains well cemented elongate concretions exposed in Palo Duro Wash (and Salas Arroyo). Top of deposits are less than 35 m above the Rio Grande channel. Forms the most laterally extensive terrace deposit in the map area.

01-02-02-01-00 — unit — Qris — Rio Grande alluvium, intermediate sandy fluvial deposits — Very pale-brown to light-gray (10YR 7/3-7/1), poorly to moderately consolidated, locally well cemented, moderately sorted, medium to thick bedded, medium- to very coarse-grained, trough-cross bedded sandstone with scattered medium-bedded pebble conglomerate and mudstone (rip-up) intraclasts. Gravels contain abundant rounded orthoquartzite and minor rounded polished chert and subrounded granite. Overlies slightly tilted conglomerate and conglomeratic sandstone of the Sierra Ladrones Formation. Probably represent thick aggradational succession of sand laid down during aggradation of the ancestral Rio Grande. Overlain by gravelly terrace deposit of unit Qrig, which likely deposited coevally with this unit. Locally overlies Deposit thickness is variable, and ranges from 3 m to over 20 m.

01-02-02-02-00 — subunit — Qrise — Rio Grande alluvium, eolian sand of intermediate fluvial deposits — Yellowish-red (5YR 4/6), moderately consolidated, well sorted, fine- to medium-grained clean sand lying beneath sand and gravel of unit Qris exposed just northwest of La Joya cemetery along north side of Salas Arroyo. Base not exposed, but unit is at least 2 m thick.

01-02-03-00-00 — unit — Qro — Rio Grande alluvium, undivided oldest terrace deposits — Brown (7.5YR 5/4), poorly consolidated, pebbly to cobbly sand. Unconformably overlies slightly tilted conglomerate of the Sierra Ladrones Formation. Gravels are generally smaller than 3 cm diameter, but a few clasts are up to 15 cm in diameter. Gravel count (n=269) on terrace exposed on hill just north of Cañada Ancha yielded 43% quartz and rounded orthoquartzite, 29% polished chert, 20% volcanic rocks, 3% black and white chalcedony and chert that resembles the Oligo-Miocene Pedernal Member of Abiquiu Formation (see Connell, 2004), 3% granite, 2% limestone rock types. Very sparse rounded pebbles of black obsidian are also found near this gravel-count locality. Deposits site between 30 and 90 m above the floor of the Rio Grande. Deposits are approximately 5 to 22 m thick.

01-02-03-01-00 — subunit — Qro2 — Rio Grande alluvium, younger subunit — Poorly consolidated, pebbly to cobbly sand. Deposits sit approximately 30 to 65 m above the Rio Grande channel.

01-02-03-02-00 — subunit — Qro1 — Rio Grande alluvium, older subunit — Poorly consolidated, pebbly to cobbly sand. Deposits sit between 58-100 m above the Rio Grande channel.

01-03-01-00-00 — unit — Qa — Stream alluvium, undivided — Poorly to moderately sorted, poorly consolidated pebble- to cobble conglomerate and fine-to coarse-grained sand with local accumulations of cobbles and small boulders. Underlies narrow to broad streams and is inset against low terrace deposits. Includes active alluvium of the Rio Salado and Rio Puerco. Corresponds to unit Qt7 of Treadwell (1996) and portions of units Hch and Hcl of Pearce and Kelson (2004). Deposits are generally thin and range from less than 1 m thick to over 2 m in thickness.

01-03-02-00-00 — unit — Qay — Stream alluvium, undivided young deposits — Light reddish-brown (5YR 6/4), poorly to moderately sorted, poorly consolidated light- brown and light reddish-brown to gray-brown pebble and cobble conglomerate and sand with minor accumulations of boulders. Deposit surfaces are less than 5 m above local base level near mouths of tributary drainages, but sit less than 0.5 m above local base level upstream. Soils are weakly developed. Locally divided into two subunits based on inset relationships within major tributary drainages, such as Palo Duro Wash (Salas Arroyo).

01-03-02-01-00 — subunit — Qayy — Stream alluvium, younger subunit — Light reddish-brown (5YR 6/4) silty sand and gravel. Corresponds to unit Qt6 of Treadwell (1996). Treadwell (1996) reports that a similar deposit at an archaeological site yielded a radiocarbon date of 1635±60 yrs. BP (Winter (1982) cited in Treadwell, 1996). Deposit is about 3 m thick.

01-03-02-02-00 — subunit — Qayo — Stream alluvium, older subunit — Silty sand and gravel. Inset against older terrace deposit of the ancestral Rio Grande. Deposit surface contains weakly developed soil with Stage II pedogenic carbonate morphology. Deposit sits about 9 m above local base level. Corresponds to unit Qt5 of Treadwell (1996) and correlates to unit Q8 of Connell (1996). Deposit is about 2 m in thickness.

01-03-03-00-00 — unit — Qam — Stream alluvium, undivided intermediate deposits — Weakly consolidated sand and gravel associated with first inset drainages east of Rio Grande. Inset against older stream alluvium and locally divided into three subunits.

01-03-03-01-00 — subunit — Qam3 — Stream alluvium, younger subunit — Brown (7.5YR 5/4), weakly consolidated, poorly exposed, sand and pebbly sand associated with inset drainages east of Rio Grande. Soils are weakly developed and exhibit Stage I+ pedogenic carbonate morphology. South of Palo Duro Canyon, these deposits locally overlies well developed soil formed on older stream alluvium (Qao) and intermediate Rio Grande terrace deposits (Qrig, Qris).

01-03-03-02-00 — subunit — Qam2 — Stream alluvium, intermediate subunit — Weakly consolidated sand and gravel associated with first inset drainages east of Rio Grande. Soils are moderately developed and exhibit Stage III pedogenic carbonate morphology.
Corresponds to unit Qt4 of Treadwell (1996). Treadwell (1996) divided this deposit into three subunits. Deposits range from 17-23 m in thickness.Weakly consolidated sand and gravel associated with first inset drainages east of Rio Grande. Soils are moderately developed and exhibit Stage III pedogenic carbonate morphology.
Corresponds to unit Qt4 of Treadwell (1996). Treadwell (1996) divided this deposit into three subunits. Deposits range from 17-23 m in thickness.Weakly consolidated sand and gravel associated with first inset drainages east of Rio Grande. Soils are moderately developed and exhibit Stage III pedogenic carbonate morphology.
Corresponds to unit Qt4 of Treadwell (1996). Treadwell (1996) divided this deposit into three subunits. Deposits range from 17-23 m in thickness.
Weakly consolidated sand and gravel associated with first inset drainages east of Rio Grande. Soils are moderately developed and exhibit Stage III pedogenic carbonate morphology.
Corresponds to unit Qt4 of Treadwell (1996). Treadwell (1996)

01-03-03-03-00 — subunit — Qam1 — Stream alluvium, older subunit — Light reddish-brown (5YR 6/4), moderately consolidated sand and gravel. Gravels consist of limestone, granitic and metamorphic, and red sandstone rock types. Deposit surface exhibits well developed soils with Stage III+ pedogenic carbonate morphology. Corresponds to unit Qt3 of Treadwell (1996). Deposits are approximately 2 m thick and sit about 29 m above local base level.

01-03-04-00-00 — unit — Qao — Stream alluvium, undivided older deposits — Moderately consolidated sand and gravel associated with a valley border fan that buries paleo-bluffs formed by initial incision and early development of the ancestral Rio Grande Valley. Gravels are subangular to subrounded pebbles and cobbles of limestone, sandstone, granitic, metamorphic and sparse volcanic rock types indicating derivation from drainages derived from uplands to the east. Inset against the Sierra Ladrones formation. Locally divided into three subunits based on inset relationships. Undivided alluvium is delineated in Pascual Arroyo pending future work on adjacent Abeytas quadrangle.

01-03-04-01-00 — subunit — Qao3 — Stream alluvium, younger subunit — Pink to reddish-yellow (7.5YR 6/4-7/4), moderately consolidated, poorly stratified sand and pebbly sand. Deposit surface is locally stripped and soils exhibit Stage III+ pedogenic carbonate morphology. Overlies intermediate terrace deposit of the ancestral Rio Grande (Qris) and is locally overlain by intermediate stream alluvium. Inset against unit Qf2 of Treadwell (1996) and overlies older ancestral Rio Grande alluvium. Deposit is 3 to 10 m thick.

01-03-04-02-00 — subunit — Qao2 — Stream alluvium, intermediate subunit — Reddish-yellow to brown (5YR 4/6-5/6 and 7.5YR 5/3-7/4), moderately consolidated, poorly stratified sand and gravel with red (2.5YR 5/6) mud. Deposits are associated with a valley border fan that buries a paleo-bluff formed by a terrace deposit of the ancestral Rio Grande. Contains lenses of white (10YR 8/2) moderately sorted sand and pebbly sand of ancestral Rio Grande terrace deposits. Soil developed on deposit surface is partly stripped, but plugged by carbonate, suggesting the presence of Stage III+ or IV pedogenic carbonate morphology. Deposit sits about 38 m above local base level.
Well exposed in Palo Duro Wash where it is inset against the oldest inset terrace of the ancestral Rio Grande (Qao). Corresponds to unit Qf2 of Treadwell (1996).
Thickness is variable and ranges between 17-33 m. This thickness variation is probably the result of burial of incised paleotopography.

01-03-04-03-00 — subunit — Qao1 — Stream alluvium, older subunit — Weakly consolidated sand and gravel associated with first inset drainages east of Rio Grande. Poorly exposed.
Deposit surface is partially stripped and soils exhibit Stage III+ pedogenic carbonate morphology. Forms highest preserved inset tributary stream deposit east of the Rio Grande Valley. Corresponds to unit Qt1 of Treadwell (1996). Deposit ranges from 5 to more than 15 m thick.

01-04-01-00-00 — unit — af — Artificial fill — Dumped fill and areas affected by human disturbances.
Mapped where deposits are areally extensive and commonly includes levees and small earth-fill dams.

01-04-02-00-00 — unit — Qe — Eolian sand and stream alluvium, undivided — Unconsolidated to very poorly consolidated, moderately to well sorted, light brown sand. Forms extensive sheets and low dunes. Common north of Rio Salado and west of Rio Grande. Deposits range from less than 1 m to more than 3 m in thickness.

01-04-03-00-00 — unit — Qae — Eolian sand and stream alluvium, undivided — Unconsolidated to very poorly consolidated, moderately to well sorted, light reddish- brown to light-brown, fine- to medium-grained sand and silty sand with scattered pebbles that commonly forms a relatively thin, discontinuous mantle over broad upland areas.

01-04-04-00-00 — unit — Qca — Colluvium and alluvium, undivided — Poorly consolidated, poorly sorted and stratified, fine- to coarse-grained, clast- and matrix- supported deposits derived from a variety of mass-movement hill-slope processes, including debris flow, shallow slump and creep. Clasts are typically angular and composition generally reflects local provenance. Colluvium is common on hillslopes, but is only differentiated where areally extensive.

02-01-01-00-00 — unit — QTsp — Sierra Ladrones Formation — Pink to reddish-yellow (7.5YR 6/6-7/3), well consolidated and moderately well cemented, poorly to moderately sorted conglomerate and conglomeratic sandstone. Bedding is subhorizontal to gently dipping and deposits form a westward-thickening wedge that overlies moderately tilted volcanic rocks. Geologic mapping on the adjacent Mesa del Yeso quadrangle to the south (Cather, 1996) indicates that these gently dipping deposits overlie moderately dipping beds of the Miocene Popotosa Formation (Cather et al., 1994). Deposit surface is commonly mantled by thick (less than 0.5 to more than 1 m thick) poorly consolidated colluvium, alluvium, and eolian deposits. No fossils have been reported, however, similar strata mapped to the south in Valle de la Parida yielded Pliocene-aged mammal fossils (Sealey et al., 2001).
Interfingers with fluvial deposits of the ancestral Rio Grande (QTsa), which contain very sparse rounded obsidian, suggesting a late Pliocene or early Pleistocene age. Deposit surface is preserved along the eastern margin of the map area, where a strongly developed soil is exposed. This soil exhibits Stage III+ to possibly Stage IV pedogenic carbonate morphology and represents a local depositional top to the Santa Fe Group basin fill. Treadwell (1996) reported soil-profile development of Stage V to VI on the Pino surface, relict piedmont-slope surfaces locally preserved on the adjacent Becker SW quadrangle. Gravels are dominated by sandstone, limestone, granitic, and volcanic rock types indicating derivation from the Joyita Hills and southern Los Pinos Mountains. Paleocurrent data, measured from pebble imbrications, channel margins, and cross beds, indicate a generally northwesterly to westerly paleoflow direction, which supports derivation from the east. No direct age control is presently known for deposits on this quadrangle, however, similar deposits exposed south near Valle de la Parida (DeBrine et al., 1963; Cather, 1996) contain Pliocene fossils (Sealey et al., 2001). An obsidian pebble was recovered from these deposits in Pascual Arroyo, suggesting either a Pliocene or early Pleistocene maximum age. Corresponds to unit Qp of Treadwell (1996). Treadwell (1996) considered the upper several meters of this unit to represent a younger inset unit, however, mapping indicates that the uppermost gravels that underlie the broad, west- sloping surfaces along the northwestern margin of the map area are part of the aggradational succession of the Santa Fe Group basin fill. Unit thickens to the west and ranges from about 10 m to well over 300 m in exposed thickness. Divided into three textural facies using the approach of Cather (1997): a proximal, and typically upper, conglomeratic unit (QTspc), a conglomerate and sandstone unit (QTspcs), and a sandstone-dominated unit (QTsps).

02-01-01-01-00 — subunit — QTspc — Sierra Ladrones Formation, conglomeratic piedmont deposits — Pink to reddish- yellow (7.5YR 6/6-7/3), well consolidated and moderately well cemented, poorly sorted conglomerate with minor, thin to medium bedded sandstone interbeds.

02-01-01-02-00 — subunit — QTspcs — Sierra Ladrones Formation, conglomeratic-sandstone piedmont deposits — Pink to reddish-yellow (7.5YR 6/6-7/3), well consolidated and moderately well cemented, poorly sorted conglomerate with minor, thin to medium bedded sandstone interbeds. Contains thin to medium bedded sandstone beds that are commonly capped by pale- colored paleosols. Sandstone beds tend to comprise 30-50% of the unit.

02-01-01-03-00 — subunit — QTsps — Sierra Ladrones Formation, sandstone-dominated piedmont deposits — Reddish- yellow (5YR 6/6), moderately consolidated and cemented, moderately sorted tabular sandstone with scattered, minor pebbly sandstone and conglomeratic sandstone lenses. Beds commonly form upward-fining sequences with a basal conglomerate that fines upward into sandstone that is commonly capped by calcic paleosols and thin rhizoconcretionary beds. Gravel beds comprise about 10-30% of exposures. The proportion of gravel to sandstone increases upsection and to the east. Unit includes parts of the transitional axial-piedmont facies of Cather (1996). Exposed thickness is greater than 5 m. Unit is exposed just east of the axial-fluvial facies of unit QTsa.

02-01-02-00-00 — unit — QTsa — Sierra Ladrones Formation, axial-fluvial deposits — Gravels contain abundant volcanic (~40%), granite (25%), rounded orthoquartzite (20%) and polished rounded chert (15%) and differ in composition from the more angular, volcanic and sedimentary dominated clasts found in the piedmont facies. May include deposits of unit Qris exposed east of the Rio Grande Valley, near the northern part of the map. Base not exposed, but unit is at least 5 m thick.

02-01-03-00-00 — unit — Tc — Ceja Formation — Pinkish-gray to light-brown (7.5YR 6/4-7/3), moderately consolidated, moderately to well sorted sandstone with interbedded mudstone, ledge-forming, well cemented sandstone beds and cobbly sandstone and conglomerate interbeds. Paleocurrent observations from cross bedding and gravel imbrications indicate a southerly to southwesterly flow direction. Gravels contain abundant volcanic rock types with lesser amounts of granite and sparse chert, sandstone, and limestone. The predominance of volcanic rock types suggests a source from the paleo-Rio Salado, which heads into volcanic terrain. Connell et al. (2001) interpreted these deposits to have been deposited by east-flowing streams, rather than by west flowing streams draining the Joyita Hills and Los Pinos Mountains as suggested by Machette (1978). Unit is provisionally correlated to the Ceja Formation.

02-01-04-00-00 — unit — Tp — Popotosa Formation — Unit is shown on cross section only. Moderately tilted, volcanic-bearing conglomerate and sandstone. Includes Broken Tank and Bear Canyon basalts. The contact between the Popotosa and Sierra Ladrones formations is an unconformity that ranges in angularity from a few degrees to as much as 30° (Cather, 1996a). Unit is not exposed in the map area, but is exposed to the south. The Popotosa Formation is more than 2000 m thick west of the map area (see discussion by Connell, 2004).

02-02-01-00-00 — unit — Tlp5 — La Jara Peak Basaltic Andesite, tongue 5 — Mostly medium gray to purplish gray, massive and platy to vesicular basaltic andesite lavas characterized by moderately abundant (5–10%) fine- to medium-grained phenocrysts of olivine, usually altered to reddish brown iddingsite. Phenocrystic plagioclase is typically absent. Thin flows (3-6m) commonly exhibit vesicular tops and reddish basal breccia zones. Tlp5 is older than South Canyon Tuff and younger than the Lemitar Tuff. Maximum thickness 210 m. (Note: Tlp4, between Tl and Tvp, is locally absent in the La Joya quad).

02-02-02-00-00 — unit — Tl — Lemitar Tuff, upper member — Densely welded, red to grayish red, phenocryst-rich (30–45%), dacitic to rhyolitic ignimbrite. Contains sparse to abundant, medium- grained (1-4 mm) phenocrysts of quartz, sanidine, plagioclase, and biotite with traces of augite and sphene. Lower third of upper member is relatively quartz poor (<5%) compared to upper two thirds, which is quartz rich (10–15%). Sparse, phenocryst-rich pumice and small (<1 cm) grayish red "magma clots" of dacite/andesite porphyry are common near top. Erupted from the Hardy Ridge caldera in the west-central Magdalena Mountains (G. R. Osburn oral commun. 1997, Chamberlin et al, 2004). Mean 40Ar/39Ar age of bulk sanidine separate is 28.00 ± 0.08 Ma; paleomagnetic polarity is normal (McIntosh and others, 1991). Thickness 0-30m; wedges out against paleotopographic high formed by footwall of East Joyita fault.

02-02-03-00-00 — unit — Tvp — Vicks Peak Tuff — Cliff-forming, brown to light brownish gray and light gray, phenocryst poor, pumiceous, densely welded rhyolite ignimbrite. Distinctive aspects include craggy cliff-forming character, pervasive well developed compaction foliation, and large "sandy" (vapor phase) pumice lapilli up to 30 cm long. Contains 1–5 percent phenocrysts of sanidine and sparse quartz. Erupted from the Nogal Canyon caldera in the southern San Mateo Mountains (Osburn and Chapin, 1983). Mean 40Ar/39Ar age is 28.56 ± 0.06 Ma; paleomagnetic polarity is reverse (McIntosh and others, 1991). Correlation based on lithology and relative stratigraphic position. Thickness, 0-60m, wedges out against paleotopographic high formed by Laramide compression ("Los Alamos" monocline) near the East Joyita fault.

02-02-04-00-00 — unit — Tlp3 — La Jara Peak Basaltic Andesite, tongue 3 — Medium gray to purplish gray, basaltic andesite lavas characterized by sparse small reddish brown phenocrysts of "iddingsite" (oxidized and hydrated olivine). Locally represents stacked flows. Tlp3 is older than the Vicks Peak Tuff and younger than the La Jencia Tuff. Thickness is about 20-30m; locally draped (appears folded) against the paleotopographic high of the La Joyita Hills monocline.

02-02-05-00-00 — unit — Tlj — La Jencia Tuff — Light gray, pale red and grayish red, phenocryst poor, rhyolite ignimbrite, characterized by gray massive basal zone and a medial zone of densely welded rheomorphic (flow banded) ignimbrite. Flow-banded core grades to eutaxitic ignimbrite near base and top. Flow banded zone is absent north of Ojo del Padre. Contains sparse (3–5%) phenocrysts of sanidine and quartz with rare plagioclase and biotite. Locally includes thin tuffaceous sandstone beds at top of unit. Erupted from Sawmill Canyon caldera in the west-central and eastern Magdalena Mountains (Osburn and Chapin, 1983). Mean 40Ar/39Ar age from bulk sanidine separate is 28.85 ± 0.04 Ma; paleomagnetic polarity is reverse (McIntosh et al., 1992).
Thickness is 120-150m. Locally appears draped against the early rift La Joyita Hills monocline.

02-02-06-00-00 — unit — Tzt — Tuff of Luiz Lopez Formation — Light brownish gray to light gray, nonwelded to poorly welded, pumiceous, lithic-rich to lithic-poor, rhyolitic ignimbrite. Contains moderately abundant pumice (mostly aphyric), and sparse to moderately abundant small lithic fragments in crystal-poor rhyolitic matrix. Lithic fragments consist primarily of andesite porphyries and rare crystal-rich Hells Mesa Tuff clasts. Erupted from a small collapse structure in the northern Chupadera Mountains (Chamberlin et al., 2004). Samples from Chupadera Mountains yield mean single-crystal sanidine 40Ar/ 39Ar age of 30.04± 0.16 Ma. Thickest (30m) near arroyo Rosa del Castillo. Generally absent north of Canada Ancha drainage, except for 10m thick exposure north of Ojo del Padre.

02-02-07-00-00 — unit — Tlp2 — La Jara Peak Basaltic Andesite, tongue 2 — Medium gray to purplish gray, basaltic andesite lavas characterized by sparse small reddish brown phenocrysts of "iddingsite". Tlp2 is older than the Tuff of Luis Lopez Formation and younger than the Hells Mesa Tuff.
Restricted to area near Ojo del Padre; thickness about 10-30m. Absent near Los Alamos Spring and Arroyo Rosa del Castillo. Although stratigraphically lower, this unit is lithologically equivalent to tongues of basaltic andesite lava previously assigned to the La Jara Peak Basaltic Andesite (Osburn and Chapin, 1983).

02-02-08-00-00 — unit — Thm — Hells Mesa Tuff — Pale reddish gray to light gray, mostly densely welded, phenocryst-rich (40–50%), quartz-rich, rhyolite ignimbrite. Typically contains abundant medium grained (1–3 mm) phenocrysts of sanidine, plagioclase, quartz and minor biotite. Quartz is minor component (1-2%) in thin basal zone, which is locally vitrophyric. Mean 40Ar/39Ar age (bulk sanidine) is 32.06 ± 0.1 Ma; paleomagnetic polarity is reverse (McIntosh et al. 1991). Erupted from Socorro caldera (Chamberlin et. al, 2004; McIntosh et. al., 1991). Thickness ranges from 120 to150 m. A nonwelded upper zone (unconsolidated, clayey crystal-rich ash), approximately 30 m thick, is anomalously preserved on the north side of Ojo del Padre.

02-02-09-00-00 — unit — Tbcp — Basaltic conglomerate beds at Ojo del Padre (new name, informal) — Cobble to boulder conglomerates and debris-flow deposits characterized by abundant basaltic andesite clasts, similar to Tlp1, and minor clasts of andesite porphyry, similar to Tav. Debris-flow beds are characterized by red clayey matrix. Thickness ranges from 0-30m. Restricted to the area north and south of Ojo del Padre; abruptly disappears northwest of the Los Alamos Spring fault and southwest of "Ernie's fault "(UTM: 0333680 E, 3793050 N). Map relationships require Ernie's fault to predate the 32 Ma Hells Mesa Tuff. Previously assigned to the regional volcaniclastic apron of the Spears Formation ("Tsp-ac" of Spradlin, 1976; "Tsp" of Beck, 1993). Coarse grain size, clast lithologies similar to immediately underlying lavas, abrupt truncation by the Los Alamos Spring fault and restricted extent imply this unit was locally derived from the "Los Alamos" monocline. Thus it is here tentatively reassigned to the Santa Fe Group.
Alternatively, Tbcp could be classified as Upper Spears Group, but this would be contrary to its observed local extent and inferred fault block source, since the Upper Spears Group is defined as a regional

02-02-10-00-00 — unit — Tlp1 — La Jara Peak Basaltic Andesite, tongue 1 — Medium gray to purplish gray, massive and platy to vesicular basaltic andesite lavas characterized by moderately abundant (5– 10%) fine- to medium-grained phenocrysts of olivine, usually altered to reddish brown iddingsite. Phenocrystic plagioclase is typically absent. Chemically this unit is a slightly alkaline trachybasalt or basaltic trachyandesite that contains 50-52% SiO_2 and 4-8 % MgO (R. M. Chamberlin, unpublished data). Thin flows (3-6m thick) commonly exhibit vesicular tops and basal flow breccias. Tlp1 is older than Hells Mesa Tuff and younger than the Blue Canyon Tuff. Locally erupted from a NE-striking basaltic andesite feeder dike east of Ojo del Padre (UTM: 0385380E, 3794900 N). A 10m-wide segment of a narrow (1-4m wide) ENE-trending basaltic andesite dike southeast of Arroyo Rosa del Castillo also probably represents a vent for this unit (UTM: 0334050E, 3791280N). Tlp1 is 0-120m thick and thickens southward from the feeder dike at Ojo del Padre. Tlp1 is absent north of this feeder dike. Tlp1 is stratigraphically older than tongues of basaltic andesite lava previously assigned to the La Jara Peak Basaltic Andesite (Osburn and Chapin, 1983).

02-02-11-00-00 — unit — Tlpt1 — La Jara Peak Basaltic Andesite, tongue 1–tephra facies — Poorly consolidated, crudely bedded, dark to medium gray, basaltic andesite tephras. Includes large spheroidal bombs of iddingsite-bearing basaltic andesite in a gray to yellowish-brown aphanitic matrix. Pyroclasts range chemically from 52-55 SiO_2 (basaltic trachyandesite to trachyandesite), suggesting initial eruption was compositionally zoned (R.M. Chamberlin unpublished data).
Thickness is 0-20m; only present immediately north of feeder dike near Ojo del Padre. Occupies same stratigraphic position as Tlp1.

02-02-12-00-00 — unit — Tbc — Blue Canyon Tuff — Light gray, partially to densely welded, moderately phenocryst-rich (10-15%), rhyolite ignimbrite. Contains medium-grained phenocrysts (1-3mm) of sanidine, plagioclase, biotite and minor quartz. Also contains 1-2% medium-gray dacitic (plagioclase-biotite phyric) pumice fiamme' and minor andesitic lithic fragments. Locally includes thin beds of pale red tuffaceous sandstone. Correlation based on relative stratigraphic position and lithologic similarity. Possibly erupted from a largely covered caldera southwest of Datil (Ratte et al., 1994). Thickness ranges from 0-15m; absent north of Ojo del Padre. Bulk sanidine 40Ar/39Ar age is 33.66 ± 0.03 Ma and magnetic polarity is reverse (McIntosh et.al, 1991).

02-02-13-00-00 — unit — Trh — Rock House Canyon Tuff and associated tuffaceous sandstones — Light gray poorly welded to nonwelded, moderately pumiceous, phenocryst-poor, rhyolitic ignimbrite and slightly younger tuffaceous sandstones (pumiceous tuff redistributed by streams). Tuff contains sparse (1-2%), small phenocrysts of sanidine, plagioclase, biotite and traces of quartz. Lenticular tuff (0-5m thick) fills shallow paleovalleys in upper Spears Formation. Overlying tuffaceous sandstones are more laterally continuous and form a distinctive light gray marker bed in the upper Spears Formation. Source unknown; more proximal outflow sheet near Datil yields mean 40Ar/ 39Ar age of 34.42 ± 0.12 Ma, magnetic polarity is reverse (McIntosh et al. 1991). Correlation based on lithology and relative stratigraphic position. 0-10m thick.

02-02-14-00-00 — unit — Tav — Andesite flow at El Valle de La Joya (new name, informal) — Purplish gray to medium gray, massive to vesicular (amygdaloidal), coarsely porphyritic, andesite lava flow. Contains moderately abundant (20-25 %) coarse (2-5mm) phenocrysts of plagioclase and black pyroxene. Unit represents a single lava flow as much as 20m thick. Interbedded in the upper Spears Formation; appears to be slightly older than the Rock House Canyon Tuff. Source is unknown; mafic dikes in the area are aphyric and lack the phenocrystic plagioclase distinctive of this unit. Chemically, the porphyritic lava is a slightly alkaline trachyandesite that contains 55- 56% SiO_2 and about 2% MgO (R.M. Chamberlin, unpublished data). Thickness ranges from 0- 20m. Distal margin wedges out to south near east end of Ojo del Padre. Unit appears to terminate abruptly against the footwall of the Los Alamos Spring fault at its northern extent.

02-02-16-00-00 — unit — Tb — Baca Formation — Reddish gray to light brown conglomerates, sandstones and mudstones of fluvial origin; locally derived from Laramide uplifts. Conglomerates contain pebbles to boulders of limestone and sandstone derived primarily from Paleozoic formations with minor clasts of Mesozoic affinity. Andesitic porphyries locally comprise 5-10 % of clasts in the uppermost Baca conglomerates SW of Arroyo los Alamos. Proterozoic-type clasts are generally rare to absent. Cobbly conglomerates are poorly indurated and commonly form gravel lags on moderate to gentle slopes. East of the East Joyita fault, the Baca Formation is 45- 90m thick and unconformably overlies Upper Cretaceous formations; paleocurrents here are generally to the east. West of the East Joyita fault, the Baca Formation is 0-20m thick and disconformably overlies Triassic to Permian strata. Near Arroyo los Alamos (eastern sector), the Baca Formation lies in slight angular unconformity or erosional unconformity on the Upper Cretaceous Crevasse Canyon Formation At the east edge of the quadrangle (UTM: 0338890 E, 3793550 N), a well indurated pebble conglomerate bed of the basal Baca Formation lies in angular unconformity on the top of the Upper Cretaceous Dakota Sandstone. Lag gravels derived from poorly indurated Baca conglomerates also mantle the Dakota Sandstone at this locality.

02-03-01-00-00 — unit — Tir — Intrusive rhyolite — Light gray to pale reddish gray, moderately phenocryst- rich (5-15%), flow banded, rhyolite dikes and plugs. NNE-trending dikes south of Los Alamos Spring are 20-100m wide. Flow folds and lineations indicate vertical to subhorizontal flow paths along dike margins. Rhyolite dikes preferentially intrude preexisting faults such as the East Joyita fault. Hydrothermal alteration is pervasive, except near margins of the dikes. Coarse-grained feldspars (4-6mm) are commonly altered to soft clay; large euhedral holes are typical of rain washed surfaces on the altered rhyolite. Biotite in the argillized rhyolite is notably fresh. Potassium metasomatized rocks in the Socorro region typically contain fresh biotite and argillized plagioclase. Unaltered dike margins contain fine- to medium-grained (1-4mm) phenocrysts of plagioclase, sanidine, biotite and quartz. The youngest formation cut by a rhyolite dike is the Hells Mesa Tuff. Aldrich et al. (1986), report a K-Ar age of 31.3 ± 1.2 Ma for the kilometer long dike south of Los Alamos Spring

02-03-02-00-00 — unit — Tib — Basaltic andesite dikes — Medium to dark gray, basaltic andesite dikes; commonly aphyric (lack phenocrysts) or contain sparse (2-5%) micro phenocrysts (< 1mm) of greenish olivine. Olivine is often altered to reddish-brown iddingsite. Some mafic dikes contain sparse small crystals of black pyroxene and traces of plagioclase. Small calcite-filled vesicles are occasionally present. Basaltic andesite dikes are usually 1 to 4 m wide and locally display curb-like chilled margins against a weathered core zone. Most basaltic dikes strike NE or ENE; NNE-striking dikes are less common and ESE-striking dikes are least common. Most mafic dikes are nearly vertical (dips > 80º). NNE-striking dikes typically exhibit easterly dips of 50-70º, indicating they have been tilted to the west along with the host strata. Where dikes intersect, the more easterly striking (or southeasterly striking) dike typically cuts the more northerly striking dike (note: dilational offset of one dike by another is exaggerated on the map). A NE-striking dike near Ojo del Padre (UTM: 0385380 E, 3794900 N) represents a feeder dike for the adjacent basaltic-andesite lava (Tlp 1) and a cogenetic basaltic tephra unit (Tlpt1). This feeder dike flares out rapidly upwards toward the vent (thickens from 1 -5 m, up section within the west-tilted Spears beds). A similar flared out portion of an ENE-trending dike (~10 m wide) near Arroyo del Castillo (UTM: 0334050 E, 3791280 N) is interpreted as a vent for basaltic andesite lavas (Tlp1) that occur about 160 meters stratigraphically above the inferred conduit, as presently exposed. A resistant knob of contact metamorphosed Spears beds, adjacent to the flare out, indicates greater magma flux along this segment of the basaltic andesite dike. Chemically, the feeder dike at Ojo del Padre is a slightly alkaline basaltic trachyandesite containing about 52% SiO_2 and 7% MgO (R.M. Chamberlin, unpublished data).
Stratigraphic relationships with regional tuffs indicate the two feeder dikes (described above) are younger than 33.7 Ma and older than 31.9 Ma. Within the La Joya quadrangle, no mafic dikes have been observed in, or above, the 31.9 Ma Hells Mesa Tuff. Tib includes a small mafic plug SE of Los Alamos Spring; this plug and nearby radiating dikes may represent a vent, but additional study is needed here.

02-02-15-00-00 — unit — Tsp — Spears Formation — Light gray and light brownish gray volcaniclastic conglomerates, sandstones, siltstones and reddish mudstones derived from intermediate composition volcanic highlands, primarily to southwest of Joyita Hills. Subrounded to subangular dacite and andesite porphyry clasts range from boulders to pebbles; they are common in lenticular to tabular 1-3m thick conglomeratic beds. Dacitic clasts are characterized by sparse to abundant phenocrysts of plagioclase, hornblende and biotite; andesitic clasts are typically plagioclase-pyroxene porphyries. Matrix supported clasts are common and indicate deposition as debris flows or hyper-concentrated mud flows. Sparse cobbles and pebbles of gray limestone and red siltstone locally occur in basal conglomerates (lowest 30m). Calcite and pinkish clays are dominant cements. Spears beds are locally silicified and contact metamorphosed adjacent to flared-out segments of basaltic andesite dikes (e.g. UTM: 0334050 E, 3791280 N). Age range from K/Ar dates of volcanic clasts and interbedded tuffs is approximately 39-33 Ma (Osburn and Chapin, 1983). Basal contact with the Baca Formation is conformable and gradational, or inter- tonguing. A south dipping andesitic mudflow bed, 2-3m thick, occurs within non-volcanic Baca conglomerates near the head of Arroyo los Alamos (UTM: 0336200 E, 3792250 N). East of the East Joyita fault (hanging wall block) the Spears Formation is approximately 700-800 m thick, whereas west of the East Joyita fault (footwall block) it is 30-90m thick. Immediately south of the La Joya quad, Cather et. al, 2004, have divided volcaniclastic sedimentary intervals below the Hells Mesa Tuff into an Upper Spears Group and a Lower Spears Group, based on dominant clast lithology. Such subdivision does not appear to be possible in the La Joya quadrangle; thus the term Spears Formation is used here.

02-03-03-00-00 — unit — Tims — Mafic sill — Medium gray, locally mottled to light gray, mafic sill (UTM: 0338420 E, 3793550 N). Contains ~ 5% fine-grained (0.5-1 mm) black pyroxene in a felted matrix of plagioclase microlites with sparse interstitial grains (1-2mm) of water clear analcite. White fibrous natrolite (in radial sheaves) and clear analcite fill large vesicles and cavities near the center of the sill. Tentatively classified as a fine-grained pyroxene diorite or gabbro. Sill is about 0-2m thick.
Silicified and bleached beds of the Mancos shale locally define its gently southwest dipping upper contact; base is not exposed. Similar mafic sills occur in the lower Mancos shale to the southeast of this locality (Becker SW 7.5' quadrangle)

03-01-00-00-00 — unit — K — Undivided upper Cretaceous units — undivided Kcc, Kg, Kth, Kml, Kd; interstratified, well-sorted sandstones, siltstones, shales, and thin coal beds. UInit approximately 396 m thick.

03-02-00-00-00 — unit — Kcc — Crevasse Canyon Formation — Non-marine and minor brackish-water sandstone, shale, and coal-bearing unit. Basal contact is sharp and upper contact is an erosional unconformity. Thickness is uncertain due to faulting and erosion; thickness estimated from the cross section of Cather et al. (2004) is 60-120 m. Crassostrea soleniscus (Meek) and Ostrea elegantula (White) occur as coquinas in a 1–2 m sandstone bed about 30 m above the Gallup and 10 m above the coal on the Becker SW 7.5' quadrangle. See Darton (1928, p.75) and Baker (1981, p. 48) for details.) Crassostrea soleniscus (Meek) probably also occurs in brackish water bed near the middle of the formation. The uppermost 30-40 m of Crevasse Canyon beds east of Arroyo los Alamos are distinctly reddened. Baker (1981) erroneously mapped these hematitic sandstones and interbedded purplish gray to yellow brown mottled mudstones of the upper Crevasse Canyon Formation as the Baca Formation. Large silicified logs are present in the hematitic zone. White sandstone beds exposed below gravel-capped mesa in SE corner of the quadrangle are of uncertain correlation (Kcc?).

03-03-00-00-00 — unit — Kg — Gallup Sandstone — Fine grained, marine, regressive, coastal barrier sandstone normally about 4-10 m thick. Light gray to yellowish gray and poorly indurated where relatively thick. Thinner sections form ledges and are often concretionary or fossiliferous. Lower contact is gradational and upper contact is sharp. Concretionary sandstones commonly yield Ostrea elegantula (White) and Pleuriocardia (Dochmocardia) curtum (Meek and Hayden).
Cremnoceramus erectus (Meek) was collected near the SE corner of the La Joya quadrangle (S.H. Hook, oral commun).

03-04-00-00-00 — unit — Kmd — D-Cross Tongue of the Mancos Shale — Noncalcareous, medium gray, marine shale unit. Contains two thin calarenites about 3–6 m above the Tres Hermanos Formation. Also contains a medial hummocky sandstone about 1.5 m thick (Kmds), and fossiliferous concretions near the top. This slope-forming unit, about 110 m thick, exhibits a sharp basal contact and a gradational upper contact. Basal calcarenites contain Prionocyclus wyomingensis (Meek) and Scaphites warreni Meek and Hayden. Concretions sometimes yield Prioncyclus novimexicanus (Marcou). Medial sandstone (Kmds) contains Forresteria sp., Lopha sannionis (White), and sparse Ostrea elegantula (White).

03-05-00-00-00 — unit — Kth — Tres Hermanos Formation — Sandstone and shale unit about 76-82 m thick.
Forms a regressive-transgressive wedge of nearshore marine and non-marine deposits. Basal contact is gradational and top contact is sharp. Consists of three members.

03-05-01-00-00 — subunit — Kthf — Fite Ranch Sandstone Member — Intensely bioturbated, coastal barrier sandstone; coarsens upward from very fine grained to lower fine grained.
Sandstones are light gray, but normally weather light to dark brown. Uppermost sandstones are usually dark brown. Member typically forms a 10–13 m thick ridge cap with sharp top and gradational base. Contains Lopha bellaplicata novamexicanum Kauffman. Near the SE corner of the quadrangle (UTM: 0337380 E, 3792400 N), a red hematitic zone locally cuts across the Fite Ranch

03-05-02-00-00 — subunit — Kthc — Carthage Member — Marine, marginal marine, and non- marine sandstone and shale slope-forming unit ranging from 58–64 m thick. Contains thin, fine-grained sandstone beds (paludal-lacustrine or crevasse splay) and lenticular cross-bedded channel sandstones in lower 2/3 of unit. Upper third is marine shale with fossiliferous concretions and Prionocyclus hyatti (Stanton).

03-05-03-00-00 — subunit — Ktha — Atarque Sandstone Member — Regressive coastal barrier sandstones, commonly weather light gray to dark brown or buff. Lower sandstones are transitional with underlying shale and constitute a 5–7 m thick, ridge-forming unit that has very fossiliferous lenses and concretionary sandstone bodies with Pleuriocardia (Dochmocardia) pauperculum (Meek) and Gyrodes spp. Uppermost bed is commonly a brackish water coquina of Crassostrea soleniscus (Meek).

03-06-00-00-00 — unit — Kml — Mancos Shale, lower — Calcareous and noncalcareous, gray, marine, slope-forming shale. Poorly exposed in the La Joya quadrangle. Uppermost 10 m of lower Mancos Shale is locally well exposed east of Arroyo los Alamos (UTM:0337200 E, 379 3100 N). Thin sandstone beds occur near base and top. Where well exposed, unit displays a sharp basal contact a gradational upper contact, numerous thin bentonite beds and a calcareous shale in upper part that weathers to a lighter gray. Upper shale contains abundant Pycnodonte newberryi (Stanton). Thin sandstones in basal 15 m contain common Ostrea beloiti Logan. In the Mesa del Yeso quadrangle, Baker (1981, p. 16) reported Conlinoceras tarrantense (Adkins) (as Calycoceras gilberti Cobban and Scott) from 25 cm above the base.

03-07-00-00-00 — unit — Kd — Dakota Sandstone — Upper 8 m is a ridge-forming, fine-grained, bioturbated, gray sandstone that weathers brownish gray. A basal sandstone, about 2 m thick, contains pebbly lenses. Pebbly beds are separated from the upper sandstone by about 5 m of medium gray, silty shale. Only trace body fossils have been found in the Dakota in the La Joya quadrangle.

04-01-00-00-00 — unit — ^d — Dockum Formation — Maroon, crossbedded siltstone and shale in upper beds. Middle beds are red, crossbedded, fine-grained sandstone that forms ledges. The lower beds are greyish-red to red siltstone and fine-grained sandstone. Locally exposed in mapped area, thickness ranges from 70 to 260 ft.

05-01-00-00-00 — unit — Ps — San Andres Limestone — Upper beds are reddish-brown siltstone and fine- grained sandstone, may be gypsiferous near the top. The bulk of the San Andres is light-gray, brown-gray to pale orange fetid limestone, with sandy lower beds. Pinkish-gray to grayish orange well sorted fine- to medium-grained quartz sandstone near middle (modified from Myers et al., 1986). Unconformable overlain by Triassic Dockum Formation. Unit thickness ranges from 235 to 520 ft.

05-02-00-00-00 — unit — Pg — Glorieta Sandstone — Cliff forming reddish-brown, grayish-orange, and yellowish-orange, fine- to medium-grained, well-sorted quartz sandstone (modified from Myers et al., 1986). Thickness is between 250 and 500 ft.

05-03-00-00-00 — unit — Py — Yeso Formation — Formation consists of orange sandstone and siltstone; white gypsum; and yellowish-gray gypsiferous limestone and sandstone.

05-03-01-00-00 — subunit — Pyjc — Joyita Sandstone and Cañas Gypsum Members — Red to grayish-orange mudstones, siltstones, and fine-grained sandstones. Lower beds of the Joyita Sandstone are gypsiferous and the lower contact is gradational into the Cañas Gypsum member (modified from Myers et al., 1986; Arendt, 1968), which is poorly exposed, absent in parts of the area, and less than 10 ft thick. The Cañas member is therefore mapped with the Joyita Sandstone as a single unit. The Joyita Sandstone is between 100 and 180 ft thick.

05-03-02-00-00 — subunit — Pym — Meseta Blanca Sandstone Member — Pinkish red, to pale orange siltstone and fine-to medium- grained cliff- and ledge- forming ripple-marked and cross-bedded sandstone. Conformably and gradationally overlies the Abo Formation (modified from Myers et al., 1986). Unit is between 250 and 350 ft thick.

05-03-03-00-00 — subunit — Pyt — Torres Member — Interbedded reddish-brown to buff siltstone and claystone, pinkish-brown to yellowish-orange gypsiferous siltstone and fine-grained sandstone, and grayish-orange to yellowish brown ridge forming gypsiferous limestone. Siltstone is more abundant at the base, while limestone is predominant at the top of the unit (Wilpot et al., 1946; Myers et al., 1986; Arendt, 1968). About 350 - 400 ft thick.

05-04-00-00-00 — unit — Pa — Abo Formation — Upper beds are interbedded pinkish and pinkish orange siltstones and greenish-gray fine-grained sandstones. Middle and lower beds are pinkish-red to reddish-gray lenticular and cross-bedded siltstones and fine-grained sandstones (modified from Myers et al., 1986). The unit is 345 to 363 ft thick.

05-05-00-00-00 — unit — Pb — Bursum Formation — Interstratified red and greenish gray arkosic shales, mudstones and breccias, with lesser, discontinuous limestone horizons. Immature, proximal deposits derived underlying Pennsylvanian and Proterozoic rocks shed from local uplift (Beck, 1993). Unit is thickened and coarse grained west of the Precambrian exposures. Unit is about 30 ft thick.

06-01-00-00-00 — unit — *m — Madera Formation — Cliff forming cherty, block, and fossiliferous bedded limestones and subordinate fine-grained sediments. Lower sequence dominated by massive limestones, while the upper sequence contains interbedded argillaceous limestones, calcareous, fossiliferous shales and micrites, and red, arkosic shales and mudstones (Beck, 1993). Unit is 0 to 250 ft thick.

06-02-00-00-00 — unit — *s — Sandia Formation — Cliff- to steep slope forming pale brown to orangish fine- to coarse- grained fossiliferous arkosic crossbedded sandstone and conglomerate. Subordinate slope forming beds of yellowish gray fine-grained sandstone and siltstone. Minor beds of medium gray calcarenite and yellowish-brown sandy calcarenite. Contains orthoquartzitic quartz-pebble basal conglomerate up to 18 ft thick (modified after Myers et al., 1986). Unit is 0-160 ft thick.

07-01-00-00-00 — unit — = — Augen gneiss — reddish-orange quartz + K-feldspar ± biotite gneiss with up to 2-cm microcline porphyroclasts; includes zone of 1-30 m thick amphibolite and less common pegmatite and aplite dikes.

Base map from U.S. Geological Survey 2020.
North American Datum of 1983 (NAD83)
Projection and 1,000-meter grid: Universal Transverse Mercator, Zone 13S, shown in blue.
10,000-foot ticks: New Mexico Coordinate System of 1983 (Central zone), shown in red.

Roads....U.S. Census Bureau 2016
Names....GNIS, 1908 - 2019
Hydrography....National Hydrography Dataset, 1899 - 2019
Contours....IFSAR 4.5 m Digital Terrain Model, 2008
Wetlands....FWS National Wetlands Inventory 1975–2002

1:24,000

1 0.5 0 1 Mile

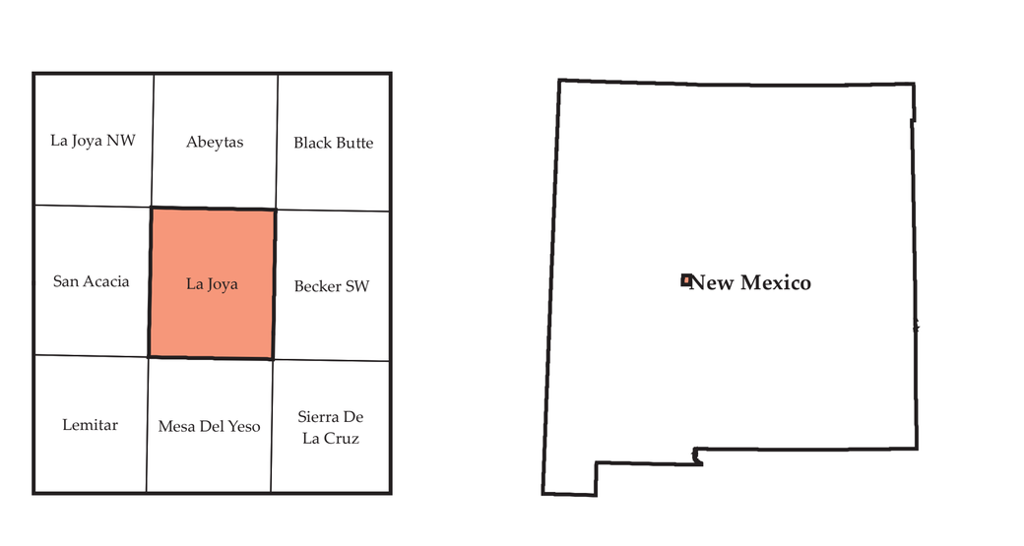
1000 0 1000 2000 3000 4000 5000 6000 7000 Feet

1 0.5 0 1 Kilometer

Contour Interval 20 Feet

North American Vertical Datum of 1988

Magnetic Declination July, 2020 8° 53' East At Map Center



Quadrangle Location

New Mexico Bureau of Geology and Mineral Resources
New Mexico Tech
801 Leroy Place
Socorro, New Mexico
87801-4796

[575] 835-5490

This and other STATEMAP quadrangles are available for free download in both PDF and ArcGIS formats at:

http://geoinfo.nmt.edu

Digital layout and cartography by the NMBGMR Map Production Group:
Phil L. Miller, Amy L. Dunn, Ann D. Knight, and Justine L. Nicolette

New Mexico Bureau of Geology and Mineral Resources
Open-File Geologic Map 102

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Geologic Map of the La Joya 7.5-Minute Quadrangle, Socorro County, New Mexico

May 2005

by
Maarten de Moor[1], Austin Sinsser[1], Karl Karlstrom[1], Richard Chamberlin[1], Sean Connell[1], and Adam Read[1]

[1]*New Mexico Bureau of Geology and Mineral Resources, 801 Leroy Place, Socorro, NM, 87801*

This draft geologic map is preliminary and will undergo revision. It was produced from either scans of hand-drafted originals or from digitally drafted original maps and figures using a wide variety of software, and is currently in cartographic production. It is being distributed in this draft form as part of the bureau's Open-file map series (OFGM), due to high demand for current geologic map data in these areas where STATEMAP quadrangles are located, and it is the bureau's policy to disseminate geologic data to the public as soon as possible.

After this map has undergone review, editing, and final cartographic production adhering to bureau map standards, it will be released in our Geologic Map (GM) series. This final version will receive a new GM number and will supercede this preliminary open-file geologic map.

DRAFT

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Explanation of Map Symbols

- 02.11.01 Fault showing local normal offset (1st option)—Ball and bar on downthrown block.
- U D 02.11.02 Fault showing local up/down offset—U is on the upthrown block, and D is on the downthrown block.
- 02.11.08 Inclined fault (1st option)—Showing dip value and direction.
- 02.11.09 Inclined fault (2nd option)—Showing dip value and direction.
- 05.10.05 Plunging fold—Large arrowhead shows direction of plunge.
- 05.11.04 Small, minor anticline, vertical or near-vertical axial surface (1st option)—Showing strike.
- 05.11.24 Small, minor syncline, vertical or near-vertical axial surface (1st option)—Showing strike.
- 06.02 Inclined bedding—Showing strike and dip.
- 06.04 Overturned bedding—Showing strike and dip.
- 08.03.02 Inclined metamorphic or tectonic foliation—Showing strike and dip.
- 09.001 Approximate plunge direction of inclined generic (origin or type not known or not specified) lineation or linear structure (1st option)
- 05.01.01 Anticline (1st option)—Identity and existence are certain. Location is accurate.
- 05.05.01 Syncline (1st option)—Identity and existence are certain. Location is accurate.
- 05.05.03 Syncline (1st option)—Identity and existence are certain. Location is approximate.
- 05.06.03 Synform (1st option)—Identity and existence are certain. Location is approximate.
- 01.01.01 Contact—Identity and existence are certain. Location is accurate.
- 01.01.02 Contact—Identity or existence are questionable. Location is accurate.
- 01.01.03 Contact—Identity and existence are certain. Location is approximate.
- 01.02.01 Key bed—Identity and existence are certain. Location is accurate.
- 01.03.01 Dike (1st option)—Identity and existence are certain. Location is accurate.
- 01.03.02 Dike (1st option)—Identity and existence are certain. Location is approximate.
- 02.01.01 Fault (generic; vertical, subvertical, or high-angle; or unknown or unspecified orientation or sense of slip)—Identity and existence are certain. Location is accurate.
- 02.01.03 Fault (generic; vertical, subvertical, or high-angle; or unknown or unspecified orientation or sense of slip)—Identity and existence are certain. Location is approximate.
- 02.01.07 Fault (generic; vertical, subvertical, or high-angle; or unknown or unspecified orientation or sense of slip)—Identity and existence are certain. Location is concealed.
- 02.02.01 Normal fault—Identity and existence are certain. Location is accurate. Ball and bar on downthrown block.
- 02.02.03 Normal fault—Identity and existence are certain. Location is approximate. Ball and bar on downthrown block.
- 02.02.07 Normal fault—Identity and existence are certain. Location is concealed. Ball and bar on downthrown block.
- 02.05.01 Rotational or scissor fault, reverse-slip offset—Identity and existence are certain. Location is accurate. Rectangles on upthrown block.
- 02.06.03 Strike-slip fault, right-lateral offset—Identity and existence are certain. Location is approximate. Arrows show relative motion.
- 02.12.01 Scarp on fault (generic; vertical, subvertical, or high-angle; or unknown or unspecified orientation or sense of slip)—Identity and existence are certain. Location is accurate. Hachures point downscarp.
- 02.14.04 Fault-breccia zone or zone of broken rock around fault
- 31.08 Map neatline

Geologic Cross Section A–A'