Geologic Map Compilation for Aggregate Resource Assessment in the Phoenix Metropolitan Area

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scale 1:250,000

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0 5 10 20 30 40 Kilometers

Contacts, faults, dikes, and veins

- contact, accurate
- contact, approximate
- contact, inferred
- contact, concealed
- contact, gradational
- fault, accurate
- fault, approximate
- fault, inferred
- fault, concealed
- normal fault, accurate
- normal fault, approximate
- low-angle normal fault, accurate
- low-angle normal fault, approximate
- thrust fault, accurate
- thrust fault, approximate
- crushed rock in shear zone
- dike or vein

Note: This map is only a graphical representation of geologic map data in the DI-43 geodatabase, and was not modified for completeness or readibility.

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Description of Map Units

Deposits of Major Rivers

Salt-Gila River Deposits

Qyrs **Young channel and floodplain deposits - Salt-Gila River** - Young coarse gravel and sand in channels, and sand, silt and clay deposited in overbank areas. Deposits are dominated by cobbles and boulders in the east, but typical gravel size diminishes substantially downstream. Pebbles, cobbles and boulders are commonly clast-supported with a coarse sand matrix. Clasts are rounded to well-rounded, with moderate to high sphericity, and poorly sorted. Quartzite and fine-grained volcanic rocks appear to be the most-resistant lithologies with the least amount of internal fracturing. Less-resistant rock types may be more abundant as pea gravel and smaller sizes. Weathering rinds are generally absent, although some coarse-grained lithologies exhibit rinds up to 1 cm thick.

Qis **Intermediate terrace deposits** - Similar physical characteristics as younger Salt-Gila deposits (unit Qyrs), but locally clasts are more weathered. Soil development in near-surface includes clay accumulation and moderate to strong calcium carbonate accumulation. Includes Blue Point and Mesa terraces of Pewe (1978).

QTors **Old terrace deposits** - High, deeply eroded coarse gravel, sand, silt and clay deposits. Lithology of clasts are similar to those observed in the modern channel (Kokalis, 1971); however, more quartzite and less basalt lithologies appear to differentiate the oldest terrace from younger ones (Larson et al., 2010). Weathering of gravel is variable, but many lithologies are highly weathered locally. Remnant planar terrace surfaces are limited in extent, and most of the deposits are deeply eroded. Strong petrocalcic soil development on well-preserved surfaces. The Sawik and Stewart Mountain terraces are grouped in this unit (Pewe, 1978; Larson et al., 2010).

Agua Fria River Deposits

Qyra **Young channel and floodplain deposits** - Recently active channel gravel and sand deposits, and sandy to silty floodplain deposits commonly underlain by older channel deposits. Deposits are dominated by cobbles and boulders upstream to the north and gradually diminish to predominantly coarse-grained pebbles and small cobbles intercalated with fine-grained sand downstream. Clasts are typically sub-rounded to rounded, low to moderate sphericity, and poorly sorted Clast size and angularity gradually decrease downstream, while degree of sphericity and sorting subtly increase. Lithologies include ~70 to 80% coarse-grained granitoid and volcanic rocks, with 20 to 30% diverse metamorphic rocks.

Qia **Intermediate terrace deposits** - Primarily cobble, boulder, pebble gravel and sand, with variable sand, silt and clay layers. Clast lithologies are similar to those observed in the modern channel, dominated by coarse-grained plutonic and volcanic rock types. Clasts are generally poorly sorted, sub-rounded to rounded, with low to moderate sphericity. Deposits are generally clast-supported, with less-thick and discontinuous sand-supported strata. Moderate to strong soil development up to weak petrocalcic horizons, and clay-rich argillic horizons, minor to moderate clast weathering.

QTora **Old terrace and alluvial fan deposits** - High, deeply eroded coarse gravel and sand deposits. Landforms range from isolated terraces in the south to extensive terraces and a very large remnant alluvial fan in the north. Planar terrace surfaces are variable depending on preservation, some older deposits are deeply eroded. Clast lithologies are similar to those observed in the modern channel, dominated by coarse-grained plutonic and volcanic rock types, but some volcanic and particularly plutonic rocks are moderately to strongly weathered. Moderate soil clay accumulation locally, and strong calcium carbonate accumulation in near surface horizons.

Gila River Deposits above the Salt-Gila confluence

Qyrg **Young channel and floodplain deposits** - Young sand, gravel, and silt deposits found in channels and overbank areas. Deposits are dominated by pebbles and cobbles upstream, but typical gravel size diminishes substantially downstream. Pebbles and cobbles are clast-supported with a coarse sand matrix. Clasts are rounded to well-rounded, with moderate to high sphericity, and poorly to moderately sorted. Felsic volcanic rocks (dacite and rhyolite) make up nearly 50% of clast lithology, with quartzite the next most abundant, nearly 25%. Intermediate volcanic rock, granite and fine-grained metamorphic rocks make up ~15% of clast lithology. Quartzite and fine-grained volcanic rocks appear to be the most-resistant lithologies with the least amount of internal fracturing. Less-resistant rock types may be more abundant as pea gravel and smaller sizes.

Qig **Intermediate terrace deposits** - Sand, gravel, silt and clay deposits in intermediate river terraces. Moderate soil development, local eolian reworking of surficials and deposits. Includes lithologically diverse rounded cobbles, pebbles, gravel and sand. Moderate soil development and some weathering of susceptible clasts, such as granite, vesicular basalt and poorly-indurated coarse-grained rocks. Locally surface sand deposits have been reworked by eolian processes.

Qorg **Old river deposits** - Similar physical characteristics as younger Gila deposits, but locally clasts are much more weathered. Soil development in near-surface is variable, but where terrace surfaces are will preserved, soil development includes clay accumulation and moderate to strong calcium carbonate accumulation. These deposits are associated with high terrace remnants and deeply dissected landforms.

Verde River Deposits

Qyrv **Young channel and floodplain deposits** - Gravel, sand, silt and clay deposits in modern channels and floodplains. Lithology of clasts include predominantly basaltic rock types (26 to 46%), granitoid rocks (10 to 41%), quartzite (11 % average), and various other volcanic rocks (10 to 29%), and metamorphic rocks (5 to 26%) (Pope, 1974).

Qiv **Intermediate terrace deposits** - Sand, gravel, silt and clay deposits in intermediate river terraces. Moderate soil development. These deposits may be also present adjacent to the Verde River near its confluence with the Salt River, characterized by moderate to strong calcic soil development. Lithology of clasts are similar to those observed in the modern channel (Pope, 1974). Terraces include the Blue Point and Mesa terraces.

Qorv **Old high terrace deposits** - High, deeply eroded coarse gravel and sand deposits of the Verde River. Planar terrace surfaces are limited, deposits are typically deeply eroded. Strong calcic soils development on well-preserved surfaces, weathering of susceptible lithologies. Lithology of clasts are similar to those observed in the modern channel (Pope, 1974). These deposits may be also present adjacent to the Verde River near its confluence with the Salt River, characterized by moderate to strong calcic soil development. These terraces include the Sawik and Stewart Mountain terraces.

Hassayampa River Deposits

Qyrh **Young channel and floodplain deposits - Hassayampa River** - Sand and gravel deposits of the modern channels and low terraces, with minor silt and clay. Gravel is commonly pebbles and small cobbles, lithologies include granitic and metamorphic rocks and volcanic rocks.

Qih **Intermediate terrace deposits** - Sand and gravel deposits of intermediate terraces, with minor silt and clay. Gravel is commonly pebbles and cobbles, lithologies include granitic and metamorphic rocks and volcanic rocks.

Qorh **Old terrace and fan deposits** - Higher dissected river gravel and sand deposits associated with high river terraces and a very old alluvial fan. Sand and gravel deposits, with minor silt and clay. Gravel is ranges from pebbles and small boulders, Lithologies include granitic and metamorphic rocks and volcanic rocks. Moderately to highly weathered gravel common; strong petrocalcic surface soil where unit is well preserved.

Deposits of Larger Tributaries

New River Deposits

Qyrn **Young channel and floodplain deposits** - Channel sand and gravel and finer floodplain deposits of the New River above the confluence with the Agua Fria River. Gravel includes basalt and granitic rock, includes common boulders in upstream areas, cobbles and pebbles common downstream.

Qin **Intermediate terrace deposits** - **Intermediate terrace deposits** of New River. Primarily cobble, boulder, pebble gravel and sand, with variable sand, silt and clay layers. Basalt and granitic clasts are common. Moderate to strong soil development, minor to moderate clast weathering.

Qorn **Old terrace deposits** - High, deeply eroded gravel and sand deposits of New River. Planar terrace surfaces are variable depending on preservation, some older deposits are deeply eroded. Basalt and granitic clasts, some highly weathered. Strong calcic soil development on well-preserved surfaces, intense weathering of susceptible lithologies.

Skunk Creek Deposits

Qyrk **Young channel and terrace deposits** - Young cobble, pebbles and boulder gravel, sand and finer grained deposits in active channels and on the floodplain.Basalt and other fine-grained volcanic rocks are common.

Qik **Intermediate terrace deposits** - Intermediate terrace and fan deposits. Primarily cobble, boulder, pebble gravel and sand, with variable sand, silt and clay layers. Basalt and felsic volcanic clasts are common. Moderate to strong clay and calcium carbonate soil development, minor to moderate clast weathering.

Qork **Old terrace and alluvial fan deposits** - High, deeply eroded gravel and sand deposits. Planar terrace surfaces are variable depending on preservation, some older deposits are deeply eroded. Strong calcic soils development on well-preserved surfaces, intense weathering of susceptible lithologies.

Cave Creek Deposits

Qyrc **Young channel and terrace deposits** - Young pebble to boulder gravel, sand and finer grained deposits in active channels and on the floodplain.Deposits are dominated by cobbles and boulders along upper Cave Creek. Lithologies include basalt, andesite, and green metavolcanic clasts, with minor granite and crystalline metamorphic rocks. Lower Cave Creek fan deposits are almost entirely obscured by development, but generally consist of pebbles, sand, silt and clay.

Qic **Intermediate terrace and alluvial fan deposits** - Intermediate fan and terrace deposits. Primarily cobble, boulder, pebble gravel and sand, with variable sand, silt and clay layers along upper Cave Creek. Lithologies include basalt, andesite, and green metavolcanic clasts, with minor granite and crystalline metamorphic rocks. Very extensive alluvial fan along lower Cave Creek almost entirely obscured by development, but is fine gravel, sand, silt and clay. Moderate to strong soil development, minor to moderate clast weathering.

QTorc **Old terrace deposits** - High, deeply eroded coarse gravel and sand deposits. Planar terrace surfaces are variable depending on preservation, most older deposits are deeply eroded. Lithologies include basalt and metavolcanic clasts. Strong calcic soils development on well-preserved surfaces, intense weathering of susceptible lithologies.

Queen Creek Deposits

Qyrq **Young channel and terrace deposits** - Young gravel, sand and finer grained deposits in active channels and on the floodplain and fairly extensive alluvial fan.

Qiq **Intermediate terrace and alluvial fan deposits** - Intermediate terrace and relict alluvial fan deposits. Primarily cobble, pebble gravel and sand, with variable sand, silt and clay layers. Moderate to strong soil development, minor to moderate clast weathering.

Qorq **Old terrace deposits** - High, deeply eroded gravel and sand deposits. Deposits are deeply eroded and poorly preserved. Strong calcic soils development locally, intense weathering of susceptible lithologies.

Other River Deposits

Qyr **Channel, floodplain and low terrace deposits** - Channels and low terrace deposits with weak soil development are mapped as unit Qyr. Several different levels of terraces are included in this map unit. This unit contains both channel (crudely bedded coarse sands, gravels, and cobbles) and overbank (finely laminated clays, silts, and fine sands) sediments. Soil development is limited to slight organic accumulation at the surface and some bioturbation.

Qi **Intermediate river terrace deposits** - tincludes intermediate terraces with moderate to strong soil development up to about 50 ft above the modern channel. Deposits are subrounded to angular gravel, with reasonable lithologic mix, sand, silt, and clay. Soil development includes relatively thick argillic horizons with clay textures and abundant carbonate, but weak to no cemented petrocalcic horizons.

Qor **Old, high river terrace deposits** - Very old, very high, degraded river terrace remnants are mapped as Qor. Qor terraces exist as isolated remnants standing high above the modern stream channels. Because Qor terrace deposits have been exposed to erosion for much of the Quaternary, they seldom retain their original terrace form and instead form a series of isolated ridges and hills. Qor deposits are coarse, with clasts ranging in size from pebbles to boulders. Coarse-grained rocks at the surface are highly pitted, and fine-grained rocks are commonly fractured. Qor soils are dominated by thick petrocalcic horizons with Stage IV-V morphology. Secondary silica incorporated within the petrocalcic horizons appears as light brown, thin laminae.

Deposits of Smaller Tributaries

Qy **Young piedmont alluvium** - Unconsolidated, stratified, poorly to moderately sorted sand, gravel, cobble, and boulder deposits that underlie active channels, low terraces, and alluvial fans. Alluvial surfaces exhibit bar-and-swale topography, with the ridges typically being slightly more vegetated. Surfaces have minimal or no rock varnish or desert pavement development. Late Holocene soils are minimally developed, but older Holocene soils typically contain cambic horizons, weak calcic horizons.

Qyi **Young and intermediate piedmont deposits** - Qyi is a composite map unit that contains both late Pleistocene (Qi3) and Holocene (Qy) deposits.

Qi$_5$ **Young intermediate piedmont deposits** - Alluvial fan and terrace deposits consisting of moderately sorted, clast-supported or less commonly matrix-supported conglomerate. Surfaces are moderately incised by stream channels, but still contain constructional, relatively flat, interfluvial surfaces. Subdued bar and swale topography is common. Desert pavement and rock varnish development ranges from weak to strong. Qi3 soils commonly contain tan to red-brown argillic horizons and have moderate calcium carbonate development.

Qi$_2$ **Intermediate piedmont deposits** - Alluvial deposits include sand, gravel, silt and clay, poorly sorted. Preservation of original depositional surfaces varies from flat ridges separated by incised channels in shallow valleys, to more broadly rounded ridges where gravel is finer. Qi2 surfaces are typically 2 to 10 m above modern channels. Desert pavement and rock varnish development is moderate to strong on stable surfaces, but variable to weak on highly eroded surfaces. Soils are thick and well developed with argillic horizons and fairly strong calcic horizons.

Qi **Middle and young intermediate deposits, undivided** - Moderately consolidated sand, sandy gravel, or gravel deposits underlying surfaces with some soil development, genererally redder than Qy soils, with less clay and carbonate accumulation than Qo soils. Surfaces slightly to moderately incised by active channels.

Qi$_1$ **Older intermediate piedmont deposits** - Dissected alluvial deposits commonly located near the mountain fronts. Deposits are composed of poorly sorted sand, pebbles, cobbles, and small boulders with minor silt and clay. Surfaces are locally planar with moderate bevelling near the edges and have dark, strongly developed pebble-cobble desert pavements, but more typically are moderately to highly eroded into rounded ridges. On well-preserved surfaces, soil development is strong and may include clay argillic horizons with strong calcic horizons. More eroded surfaces may be littered with calcic debris from underlying soil horizons,

Qo **Old piedmont deposits** - Deposits consist of very poorly sorted cobbles to clay, including angular to subangular cobbles and pebbles and clay. Deposits are moderately consolidated and commonly are indurated by soil carbonate. Surfaces are moderately to deeply dissected. This unit occupies the highest topographic positions on the piedmonts and occurs only on the upper piedmont. The characteristic topographic expression of these deposits are alternating ridges and valleys. Soil development is moderate to strong, depending on local preservation. Reddish-brown argillic horizons are moderately- to well-developed on planar, relatively well-preserved alluvial surface remnants, but most soils are dominated by carbonate accumulation. Surfaces typically are littered by carbonate fragments derived from eroded or perturbed petrocalcic horizons, and cemented petrocalcic horizons are commonly exposed on side slopes below ridge crests.

QTs **Sandstone, siltstone and conglomerate, undivided** - Consolidated to partly consolidated sedimentary rocks that flank bedrock exposures. Thin soil horizons developed on alluvium are probably Quaternary in age, and substantially younger than gently dipping, underlying material. These deposit may be equivalent to youngerTsy deposits in some areas.

Basin-Floor Deposits

Qyf **Young fine-grained deposits** - Unit Qyf consists of young, fine-grained deposits that mantle much of the lowermost piedmonts and undissected basin floors. Qyf deposits typically are composed of sand, silt and clay, with some fine gravel. Soil development associated with Qyf deposits is weak, consisting mainly of eolian silt and minor carbonate accumulation.

Qe **Eolian sand deposits** - Eolian sand and silt deposits forming small to moderately large dunes. Typically adjacent to fine river floodplain deposits, implying the eolian deposits are reworked from adjacent areas.

Qiyf **Intermediate fine-grained deposits** - Complexly interfingered fine-grained Holocene and Pleistocene deposits. Little topographic relief and extensive agricultural development on these surfaces limit our ability to distinguish detailed relationships between young and old deposits. Because these surfaces are subject to sheetflooding, many of the deposits may be Holocene in age, but some soils within these low-relief areas have moderate development indicative of a late Pleistocene age.

Qif **Old, fine-grained deposits** - Unit Qif consists of fine-grained basin-floor deposits characterized by moderate to strong soil development indicative of some antiquity. Qif deposits are composed of sand, clay and silt, with some fine gravel. Minimal local topographic relief; Qif deposits typically are not topographically higher than adjacent areas covered by younger deposits. Soils have thick clay argillic horizons and moderate to strong calcic horizon development.

Miscellaneous Surficial Deposits

da **Aggregate quarry** - Areas along rivers where active or recently active aggregate operations have altered the ground surface.

d **Areas profoundly disturbed by human activity** - Areas of ground disturbance related to human activities, including disturbance related to agriculture, residential and industrial development, and highway construction. Original geology is obscure or concealed by such disturbance.

wa **Standing water in reservoirs** -

Qtc **Colluvium and talus** - Unconsolidated to moderately consolidated colluvium and talus deposits on steeper hillslopes. These hillslope deposits are typically weakly bedded, subangular to angular, poorly sorted sand and gravel.

QTls **Landslide deposits** - Poorly consolidated to unconsolidated, very poorly sorted mud to large boulders, characterized by a hummocky surface littered with boulders.

QTb **Basalt** - **Basalt** lava flows and scoria in the Sentinel-Arlington volcanic field.

Middle Miocene to Pliocene Units

Tsy **Alluvial-fan sediments and related basin-fill deposits** - In most areas this unit consists of pre-Quaternary alluvial fan deposits that reflect approximate modern topography with some incision and exhumation. Conglomeratic debris is generally poorly lithified and may contain sufficiently resistant clast to be a possible aggregate source. In some areas this unit includes sandstone and siltstone.

Tsyn **Needle Rock Formation** - In the Verde River Valley consists of sandstone and pebble to cobble conglomerate that was named the Needle Rock Formation by Pope (1974; Skotnicki, 1995). Basalt clasts are dominant in the Bartlett Dam quadrangle. This unit is older than map unit Tsy in lower Verde Valley.

Tsyp **Pemberton Ranch Formation** - This unit consists of tan to brown, poorly consolidated, thin-bedded siltstone, and is located in lower Verde Valley. It was named the **Pemberton Ranch Formation** (or Pemberton Formation) by Pope (1974), and it grades upward into clastic sedimentary rocks of map unit Tsyn.

Tmt **Mudstone of Tonto Basin** - Red mudstone and siltstone with local gypsiferous beds and green mudstone (Tonto Basin quadrangle, Ferguson et al., 1998b). Dips are generally 5° to 10° to the southwest. This unit is interbedded with an airfall tuff in the Kayler Butte quadrangle that is dated at 18.55 +/- 0.56 Ma (Mayes, 1990; Damon et al., 1996). This unit includes sandstone and local conglomerate in eastern Tonto Basin.

Oligocene to Pliocene Units

Tb **Basaltic volcanic rocks** - Generally dark lava flows and flow breccias, with minor pyroclastic rocks and volcanic-lithic sedimentary rocks. Almost all are Miocene.

Tcg **Conglomerate and local sandstone** - Conglomerate locally with sandstone, generally moderately to poorly lithified.

Ts **Sedimentary rocks, undivided** - Conglomerate, pebbly sandstone, commonly arkosic sandstone, siltstone, and rock avalanche breccia. In many areas deposition of these rocks reflects the beginning of extensional faulting and associated basin formation, and was commonly followed by volcanism.

Tx **Rock-avalanche breccia and other breccia** - Rock-avalanche breccias, talus breccias, and other breccias of uncertain origin. All breccias are thought to have been produced by surficial processes except a possible tectonic breccia related to faulting in the Teapot Mountain 7.5' Quadrangle.

Tsv **Sedimentary rocks related to Tertiary volcanism** - Volcanic-lithic sandstone and conglomerate, and less common volcanic-lithic breccia, tuff, reworked tuff, and other pyroclastic rocks.

Tt **Tuff and associated sedimentary rocks** - Massive and bedded tuff, reworked tuff, and associated tuffaceous sedimentary rocks in eastern Pinal County.

Tal **Apache Leap Tuff** - Crystal-rich, quartz latite ash-flow tuff that contains phenocrysts of plagioclase (20-30%), embayed quartz (5-10%), sanidine (5-10%), and biotite (1-5%). The tuff ranges from unwelded to densely welded, and rarely contains more than a few percent lithic fragments in its outflow sheet. Vitrophyre (obsidian) forms the base of the outflow sheet in many areas. The tuff was dated at 18.57 +/- 0.05 Ma (40Ar/39Ar sanidine, McIntosh and Ferguson, 1998).

Tr **Rhyolitic lava flows, tuffs, and domes** - Rhyolitic volcanic rock that generally contain quartz phenocrysts with or without biotote. In some areas rocks of this unit are crystal poor to aphyric, but are known or suspected to be rhyolitic.

Tv **Volcanic rocks, undivided** - Basaltic to rhyolitic lava flows, tuffs, and breccias.

Ti **Dikes and irregular shallow intrusions** - Dikes and irregular intrusions that generally consist of feldspar phenocrysts with or without quartz, biotite, and hornblende phenocrysts in a fine grained to aphanitic matrix. Includes mafic dikes and irregular intrusions, and, possibly, massive, near-vent volcanic extrusions.

Tgr **Granitic rocks** - Includes South Mountains Granodiorite and derivative chloritic breccia, granite in the Belmont Mountains, and the granitoid stock of Wood Camp Canyon.

Miocene to Cretaceous Intrusive Rock Units

TKi Shallow intrusions - Dikes and irregular intrusions that generally consist of feldspar phenocrysts with or without quartz, biotite, and hornblende phenocrysts in a fine grained to aphanitic matrix.

TKg **Granitic rocks, undivided** - Granitic rocks known or suspected to be of Laramide age (50-75 Ma) but possibly including middle Cenozoic (15-25 Ma) granitoids.

Paleozoic Rock Units

PPn **Naco Group** - Gray, blue-gray, tan and yellowish gray fine-grained limestone in 1.5-3 m-thick beds, interbedded with gray, pink and olive marl and shale. Limestone forms prominent, ledgy outcrop. Shaly units form swales between limestone ledges. Some beds are quite fossiliferous with a variety of brachiopods, corals, and bryozoan. **Naco Group** strata are exposed south and east of Superior.

Mr **Redwall Limestone** - Massive, light gray crystalline limestone in the Theodore Roosevelt Lake area. Vague, sparse bedding partings appear to be slightly silty. Contains scattered horn coral.

Dm **Martin Formation** - Thin to medium bedded, generally light gray dolomite, silty to sandy dolomite, sandstone, and shale in the Theodore Roosevelt Lake area. Includes fine- to coarse-grained quartz arenite and feldspathic quartz arenite.

Cb **Bolsa Quartzite** - Fine- to coarse-grained quartz arenite and feldspathic quartz arenite. In thicker sections, dark reddish brown sandstone grades up into buff to white sandstone. Conglomerate is locally present at the base.

CMs **Cambrian to Mississippian sedimentary rocks, undivided** - Undivided sandstone and siltstone of the Cambrian Bolsa Quartzite, variably silty and sandy dolomite and dolomitic limestone of the Devonian Martin Formation, and cherty limestone of the Mississippian Escabrosa Limestone.

Proterozoic Rock Units

Yd **Diabase** - Dark grey dikes and sills with typical sub-ophitic, diabasic texture. **Diabase** typically contains 10-30% plagioclase lathes in black groundmass of pyroxene and opaque minerals. Unit intrudes Proterozoic granitoids, Pinal Schist, Apache Group, and Troy Quartzite. Contact metamorphism with Mescal Limestone has produced asbestos minerals.

Yl **Mescal Limestone** - Brown to reddish tan cherty dolomite. Chert forms nodules and stringers that are more resistant to weathering than host carbonates and so form ribs and protruding stringers and nodules. Metamorphism associated with diabase intrusions has locally produced asbestos minerals.

YXg **Granitic rocks, undivided** - Diverse Paleoproterozoic and Mesoproterozoic granitic rock units, including common porphyritic biotite granite with 1-4 cm K-feldspar phenocrysts. Includes mafic granitoids.

YXq **Quartzite, undivided** - Quartzite and quartzose sandstone, including Mazatzal, Dripping Spring, and Troy quartzites and associated, less abundant, metasiltstone and conglomerate.

YXm **Metamorphic rocks, undivided** - Metamorphosed sedimentary and volcanic rocks, and schist and gneiss. Unit locally includes Mesoproterozoic Apache Group and intruding Sierra Ancha diabase.

Xi **Shallow intrusions** - Shallow (hypabyssal) intrusions generally consisting of rhyolite, dacite, and andesite and their low-grade metamorphic equivalents.