GEOLOGIC MAP OF THE WEST-CENTRAL GILA BEND MOUNTAINS, MARICOPA COUNTY, ARIZONA

by

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INTRODUCTION

The area described in this study includes the central Gila Bend mountains, Maricopa county, Arizona. The study area encompasses the southern one-half of the Cortez Peak Quadrangle (1:24,000) and the northern two-thirds of the Yellow Medicine Butte Quadrangle (1:24,000) (Fig. 1). Bedrock in this area consists largely of Proterozoic metamorphic rocks overlain by an extensive sequence of Miocene mafic and intermediate volcanic rocks and continental clastic rocks (Plate 1). Late Oligocene to Early Miocene granitoid plutonic rocks intrude Proterozoic rocks in the northwest part of the map. Sources of map data are shown in Figure 2, rock-unit correlations and relative ages are shown in Figure 3, and map symbols are shown in Table 1.

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PREVIOUS INVESTIGATIONS

Previous geologic studies of the area include reconnaissance studies incorporated into State geologic maps by Wilson and others (1969) and Reynolds (1988). Gilbert and Spencer (1992) recently mapped the westernmost Gila Bend Mountains, and to the northwest Spencer and others (1992) mapped the eastern Eagletail Mountains. The area directly to the west of the study area was mapped by Gilbert and others (1992), and the area directly to the east by Scott (1991). Descriptions of Tertiary sedimentary rocks south of Yellow Medicine Butte are presented by Scarborough and Wilt (1979).

GEOLOGIC SETTING

The study area is within the Basin and Range physiographic and tectonic province which, in west-central Arizona, underwent moderate to severe Tertiary extension and magmatism (Spencer and Reynolds, 1989). The study area and surrounding areas are characterized by northwest-trending normal faults and fault blocks.

In western Arizona pre-Tertiary rocks consist of granitoid and amphibolite-grade crystalline rocks of probable Proterozoic age, and sparse, greenschist- to amphibolite(?)-grade metamorphosed Paleozoic and Mesozoic sedimentary and volcanic rocks. Sparse Paleozoic and Mesozoic strata were apparently metamorphosed and preserved from erosional destruction by regional Cretaceous thrusting and thrust burial (Reynolds and others, 1986; Spencer and Reynolds, 1990). Voluminous magmatism and normal faulting occurred in the early Miocene and were followed by middle Miocene basaltic magmatism (Spencer and Reynolds, 1989).

Within the central Gila Bend Mountains mid-Tertiary plutonism, volcanism, faulting, and continental sedimentation are nearly synchronous. These events are reflected by coarsening upward continental deposits that are overlain by intermediate and mafic volcanic rocks. These volcanic and sedimentary rocks are generally tilted and unconformably overlain by gently dipping Miocene basalt (Figs 4 and 5).

STRUCTURE

The map area encompasses the east end of an area of uplifted Proterozoic and Mesozoic igneous and metamorphic rocks and Tertiary intrusions that extends 30 km northwest to the northwest end of Cemetery Ridge (Grubensky and Demsey, 1991; Gilbert and Spencer, 1992; Gilbert and others, 1992). These basement rocks are flanked by belts of mid-Tertiary continental deposits and silicic, intermediate, and mafic volcanic rocks. The east end of the area of exposed basement appears to be warped and faulted into gently east-southeast plunging antiforms and synforms with wavelengths of about 5 km (Plate 1).

The core of the basement uplift is exposed in the northwest part of the map and is bordered on the south and east by a moderate- to low-angle normal fault, herein named the Cortez Peak fault, that juxtaposes an upper plate of weakly to moderately foliated Proterozoic gneiss and schist against a lower plate of weakly to strongly foliated Proterozoic gneiss that is intruded by the mid-Tertiary Columbus Wash granodiorite. Within 1.0 km of the fault trace Proterozoic rocks in the upper plate are pervasively iron-stained. South of Cortez Peak this iron-stained zone consists of a 0.1-0.2 km wide belt of crushed, brick-red Proterozoic gneiss (Plate 1).

Proterozoic and Tertiary rocks of the upper plate are exposed over most of the map area and are generally highly faulted and locally shattered. Mafic dikes (Tdm) locally have intruded along faults. Faults within Proterozoic gneiss and associated metamorphic rocks are probably significantly more extensive and abundant than shown on plate 1. Lithologic similarity over large areas precluded recognition of these faults within the limited scope of this study. The west-central and southwest parts of the map are dominated by northwest-striking normal faults with both southwest- and northeast-side-down displacement. Down to the northeast normal faults are probably of lesser significance. Additionally, each tilt block is commonly deformed by variably dipping normal faults. In the eastern part of the map this highly deformed terrane bends to the northeast. In the northeast part of the map stratigraphic packages and tilt panels swing north-south and northwest. Just east of the map area Scott (1991) mapped a northwest-trending fault system with northeast tilting of fault blocks.

Down to the northeast, northwest-trending high-angle faults cut pre-Quaternary rock units in the southwest and northern part of the map area (Plate 1), and are likely related to Late Cenozoic block faulting. Displacements along these faults generally range from a few tens to a few hundred meters.

MINERAL DEPOSITS

The map area includes part of the Gila Bend Mountains mineral district, which has no reported production (Keith and others, 1983; see also Wilson, 1933). Numerous minor prospects are scattered throughout the map area. Just north and east of Cortez Peak in the lower plate of the Cortez Peak fault prospect pits and/or trenches are located on variably trending, iron-stained quartz veins (for example, numbers 2-4 on Table 2 and Plate 1). Just southwest of Cortez Peak along the Cortez Peak fault several prospect pits and shafts are located on brick red, hematitic, crushed gneiss in the fault's hanging wall (number 5 on Table 2 and Plate 1). In the intensely deformed gneiss in the upper plate of the Cortez Peak fault, from just southwest of Yellow Medicine Butte to the west edge of the map, numerous prospect workings are located along iron-stained shear zones (for example, numbers 6-8 on Table 2 and Plate 1). Near Sundad in the southwest part of the map a shaft is located along the contact of amphibolite and granodiorite gneiss, and pits are located along several brecciated dikes and in sheared gneiss. No mineralization was observed at the Sundad workings. Gilbert and others (1992) suggest a mid-Tertiary age for mineralization in similar rocks in the western Gila Bend Mountains immediately west of the map area. Association of mineral deposits with faults of probable mid-Tertiary age supports this interpretation.

ACKNOWLEDGEMENTS

The authors are indebted to Daniel Laux, Michael Wells and Michael Ort for insightful discussions about the map area in the office and field, and have gratefully included unpublished mapping by each of them in this report (Fig. 1). Assistance in the field by Thomas McGarvin (Arizona Geological Survey) and helpful discussions about the area's geology with Jon Spencer and Steve Richard (Arizona Geological Survey) and Steve Reynolds (Arizona State University) are gratefully acknowledged.

DESCRIPTION OF ROCK UNITS

Qs **Surficial deposits (Quaternary)**--Unconsolidated alluvium and colluvium, talus, sand and gravel in modern washes, and unconsolidated to poorly consolidated gravel, sandy gravel, and sand, locally with silt or boulders, that typically forms flat, locally incised surfaces up to 5 meters above modern drainages. Also includes moderately steep slopes mantled by boulders and underlain by weathered and disaggregated rock rubble.

QTc **Pedogenic carbonate (Quaternary and Pliocene?)**--Caliche-cemented gravel and sedimentary breccia (talus deposits?). Mapped locally in the southern part of the map, but included in Qs elsewhere.

QTs **Older surficial deposits (Quaternary to Miocene?)**--Poorly consolidated gravel with subangular clasts of Proterozoic gneiss, granitoids, and Tertiary volcanic rocks that form moderately dissected surfaces in the southern part of the map area.

Tb **Basalt (middle to early Miocene)**--Black to medium gray, fine-grained, locally porphyritic, commonly vesicular, olivine basalt. Groundmass is commonly trachytic. Generally very resistant to weathering and weathers into resistant blocks and cliffs. The upper part of the unit (Tbu) in the eastern part of the map typically forms mesa-capping flows. Red, scoriaceous breccia (Tbx) in the eastern part of the map may represent the site of a volcanic vent. Major-element oxide chemistry of one sample (AA) from this unit is reported in Table 3 and Figure 6.

Tdf **Felsic dikes (middle Miocene to late Oligocene)**--Cream to light pink to light gray, resistant, intermediate to felsic dikes and hypabyssal intrusions with approximately 1% biotite and sparse plagioclase in a microcrystalline to aphanitic groundmass. Major-element oxide chemistry of one felsic dike sample (X) is reported in Table 3 and Figure 6.

Tdm **Mafic and intermediate dikes (middle Miocene to late Oligocene)**--Aphanitic, porphyro-aphanitic, and fine-grained mafic and intermediate dikes and small intrusions.

Tt **Felsic tuffs, undivided (middle Miocene to late Oligocene)**--White to light-tan to yellow, fine-grained felsic crystal tuff and lapilli-crystal tuff and local welded tuff and tuffaceous sandstone. Moderately consolidated and commonly bedded. Locally contains approximately 1% 1- to 2-mm euhedral biotite crystals. Locally contains sand to cobble clasts of YXgn and Tm. Major-element oxide chemistry on one felsic tuff sample (BB) is reported in Table 3 and Figure 6.

Tfv **Vitrophyre (early Miocene to late Oligocene)**--Light to dark gray vitrophyre flows and breccia. Up to 30% of the rock consists of phenocrysts of hornblende, biotite, plagioclase, iron oxides, ±quartz.

Tf **Felsic volcanic rocks, undivided (early Miocene to late Oligocene)**--Lavender to light pinkish tan to buff felsic flows, and pyroclastic rocks. Flows contain some tuffaceous clasts, and tuffaceous and flow horizons locally contain abundant clasts of pumice and granitic rocks.

Tmd **Microdiorite (early Miocene to late Oligocene)**--Small bodies of green, fine-grained microdiorite composed of subequal amounts of plagioclase and hornblende crop out in the northwestern part of the map. The hornblende displays both equigranular and wispy, acicular textures; the plagioclase is equigranular. Major-element oxide chemistry of two samples (V and W) is reported in Table 3 and Figure 6.

Tm **Mafic and intermediate volcanic rocks (early Miocene to late Oligocene)**--Gray-, red-brown-, and purple-weathering, fine- to medium-grained, mafic to intermediate volcanic rocks. Commonly contains plagioclase phenocrysts, and rarely clinopyroxene and hornblende phenocrysts. Plagioclase phenocrysts are commonly altered. Locally contains secondary epidote. Massive to highly fractured and locally amygdaloidal. Red to purple liesegang banding is present locally. Chemical classification of these rocks (samples CC, and DD from this map) ranges from basalt to trachydacite (Table 3, Fig. 6).

Tc **Conglomerate (early Miocene to late Oligocene)**--Red, gray, and green granule to boulder conglomerate. Clasts are well-rounded and are up to a meter across. The conglomerate is massive or crudely layered, and was possibly deposited as matrix-supported debris flows. In the southwestern part of the map clasts were largely derived from Proterozoic gneiss, with volcanic clasts rare or absent. In the southeastern part of the map area, however, the unit contains up to 25% volcanic clasts. In the northeastern part of the map the conglomerate locally is composed of clasts of granodiorite gneiss, granite, metarhyolite, biotite/chlorite schist, gabbro, muscovite schist, green slate, banded iron formation, and minor quartzite.

Tsc **Sandstone and conglomerate (early Miocene to late Oligocene)**--Discontinuous interbeds of brick-red, tan and brown, poorly sorted, granule to cobble, fluvial conglomerate and poorly sorted, medium-to coarse-grained arkosic sandstone. The unit is transitional between Ts and Tc.

Ts **Sedimentary rocks, undivided (early Miocene to late Oligocene)**--Sandstone, conglomerate, limestone, and shale. This unit unconformably overlies Proterozoic gneiss. The lowermost few meters commonly consist of light to dark gray, platy, lacustrine limestone and gray, purple, or brown shale. Most of the unit, however, is generally brick red, moderately to poorly sorted, medium- to coarse-grained, subangular, arkosic, pebbly sandstone with subordinate granule to pebble conglomerate beds up to 25 cm thick. The unit grades upward into the bedded sandstone and conglomerate unit (Tsc). Pebbles and cobbles in this unit consist primarily of subrounded to subangular Proterozoic metamorphic rocks. Basal limestone beds are more common in the eastern part of the map and reach 7.0 m in thickness in the lower Yellow Medicine Wash area, where they are mapped separately (Tsl). Locally, very thick, massive interbeds of sedimentary breccia (Tsx) are composed of poorly sorted, angular, cobbles and boulders that probably were shed from uplifts along nearby faults. An interbedded tuff in unit Ts along the Arlington-Agua Caliente Road has yielded an age of 23.7 Ma (Scarborough and Wilt, 1979).

Tg **Columbus Wash granodiorite (early Miocene to late Oligocene)**--White, medium-grained, equigranular, hornblende-biotite granodiorite and quartz monzonite is continuous with the unit mapped by Gilbert and others (1992) to the west. Pink to white aplite dikes are locally abundant within and near the unit. Major element oxide chemistry of two samples (T and U) from the Columbus Wash Granodiorite is reported in Table 2 and Figure. 6. A sample of the Columbus Wash granodiorite 3 km west of the map area yielded a biotite K-Ar date of 22.9 ± 0.5 Ma (Gilbert and others, 1992).

KXg **Granodiorite (Cretaceous to early Proterozoic)**--Moderately to highly weathered, light tan to white, unfoliated granodiorite.

YXgn **Gneiss (middle to early Proterozoic)**--Undivided, lithologically variable, sphene-epidote-muscovite-biotite quartzofeldspathic gneiss. Contains trace amounts of zircon and apatite. Probably mainly derived from igneous, granodioritic protolith. Locally contains lenses and larger masses of fine- and coarse-grained amphibolite. For about 100 m adjacent to the contact with the amphibolite unit (YXa) west of Cortez Peak the gneiss contains abundant layers of amphibolite. The gneiss is generally weakly to moderately foliated, except near Cortez Peak where the unit is moderately to strongly foliated. Major-element oxide chemistry of two samples (Y and Z) from foliated granodiorite are reported in Table 3 and Figure 6.

YXa **Amphibolite (middle to early Proterozoic)**--Mostly dark-green, coarse- to fine-grained, foliated hornblende gabbro consisting dominantly of hornblende and plagioclase. Hornblende porphyroblasts are present locally.

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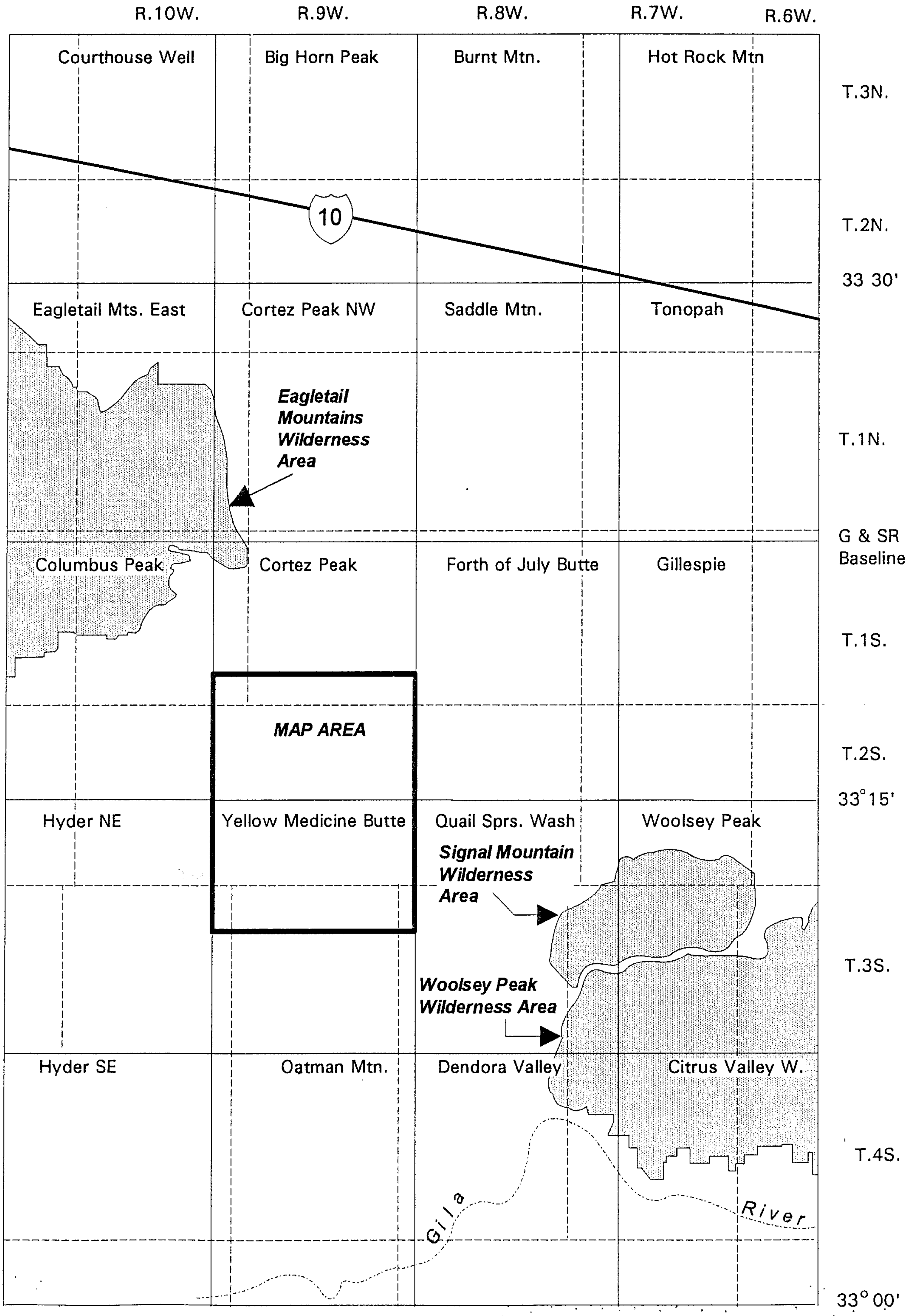


R.10W.
R.9W.
R.8W.
R.7W.
R.6W.
Courthouse Well
Big Horn Peak
Burnt Mtn.
Hot Rock Mtn
T.3N.
10
T.2N.
33 30'
Eagletail Mts. East
Cortez Peak NW
Saddle Mtn.
Tonopah
Eagletail Mountains Wilderness Area
T.1N.
G & SR Baseline
Columbus Peak
Cortez Peak
Forth of July Butte
Gillespie
T.1S.
MAP AREA
T.2S.
33°15'
Hyder NE
Yellow Medicine Butte
Quail Sprs. Wash
Woolsey Peak
Signal Mountain Wilderness Area
T.3S.
Woolsey Peak Wilderness Area
Hyder SE
Oatman Mtn.
Dendora Valley
Citrus Valley W.
T.4S.
Gila
River
33° 00'
113° 15'
113° 00'

FIGURE 1

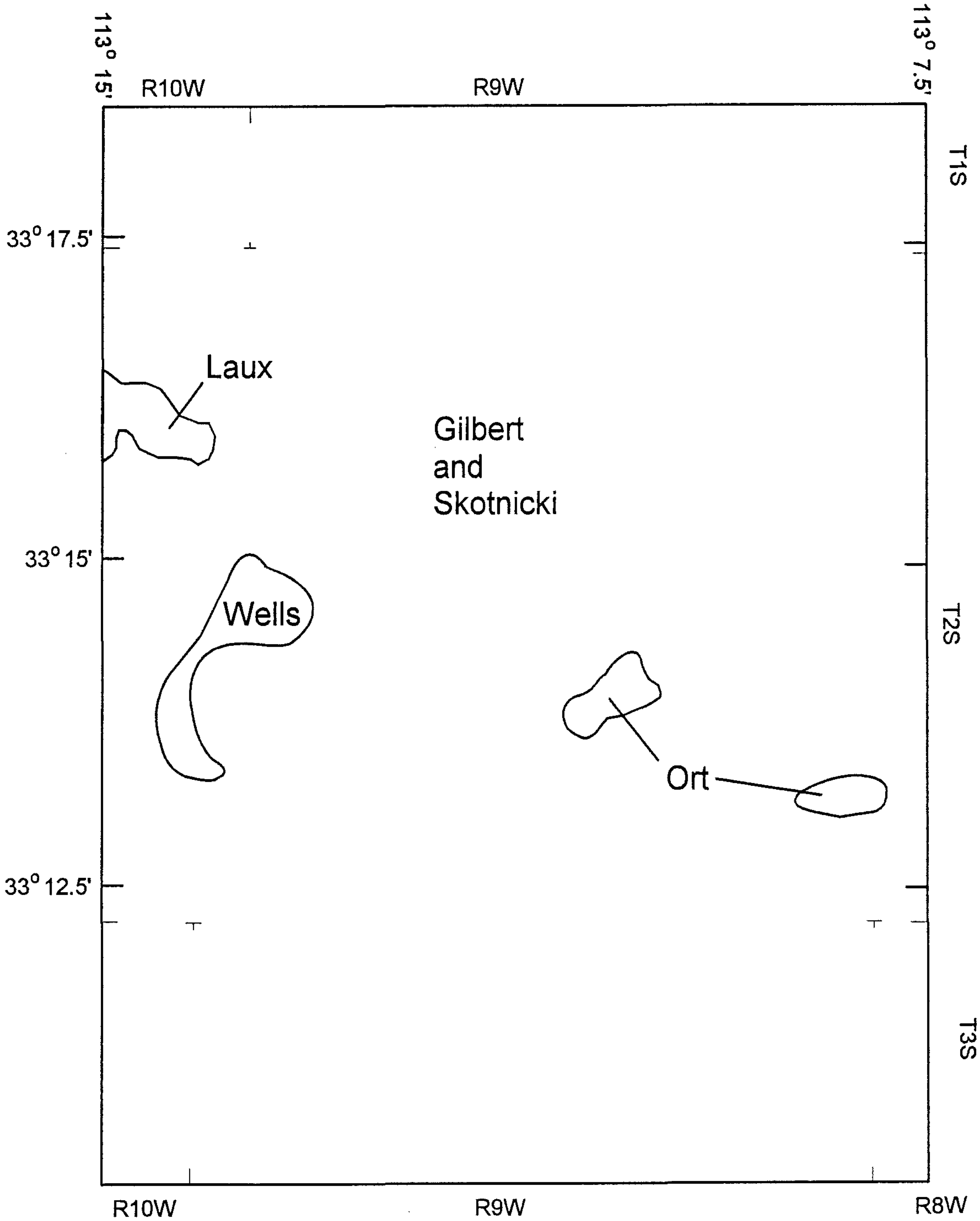
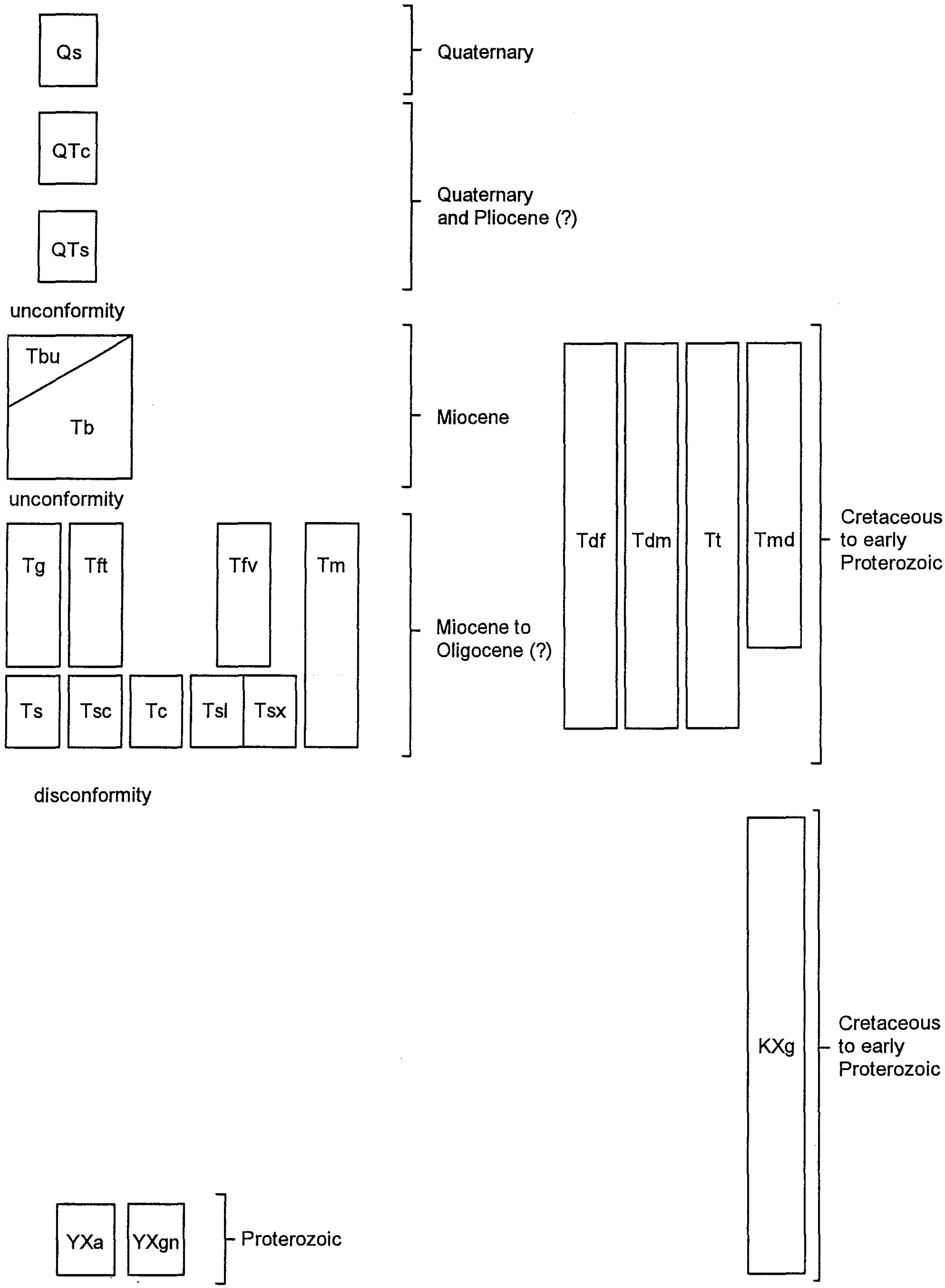


Figure 2. Respective areas mapped

Figure 3. Correlation of Map Units



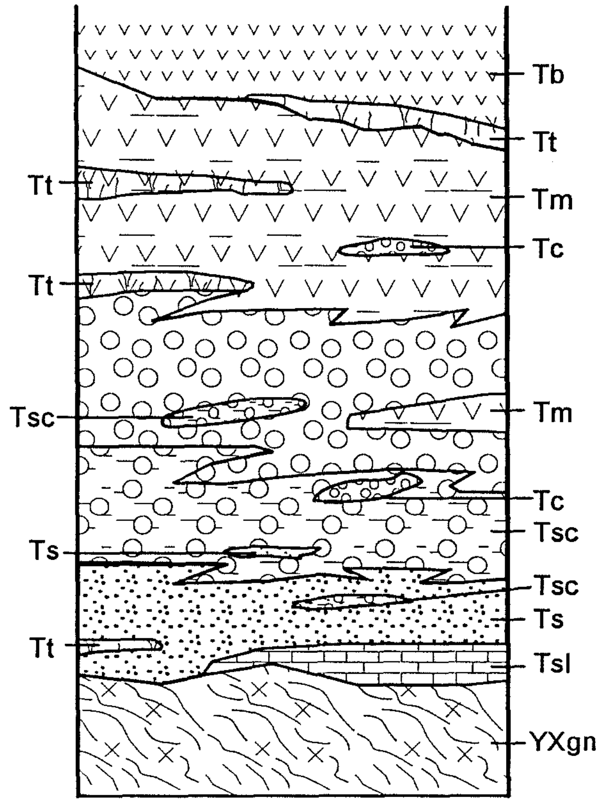


Figure 4. Diagramatic columnar section of Mid-Tertiary sedimentary and volcanic rocks in west-central Gila Bend Mountains.

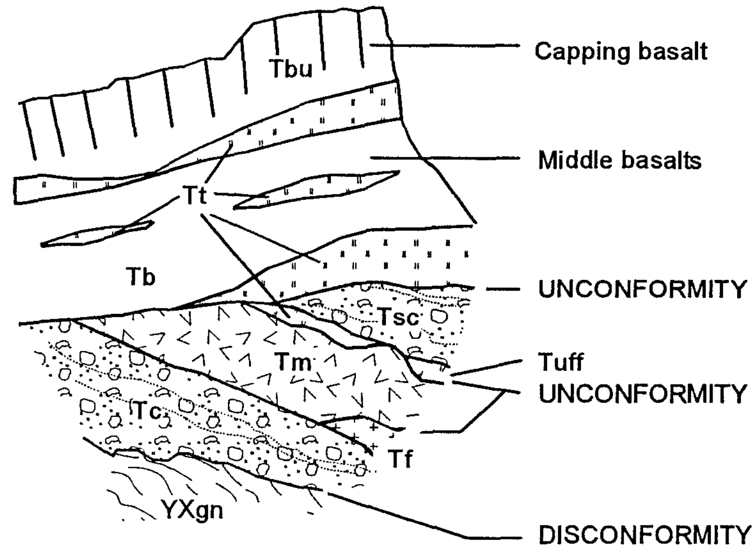


Figure 5. Sketch of geologic relationships exposed on the north side of Yellow Medicine Butte

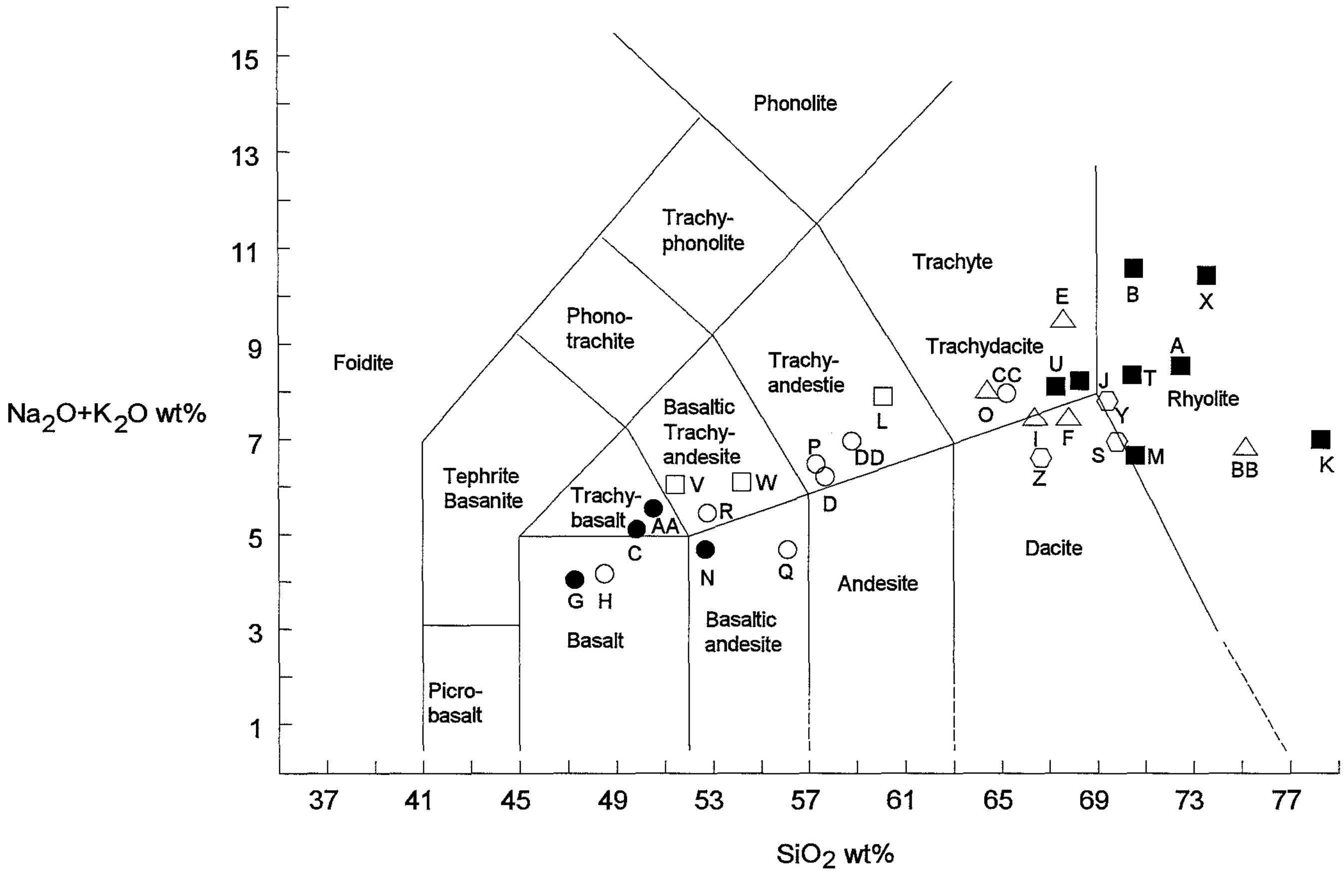


Figure 6. Total alkalies vs. SiO_2 for rocks from western and central Gila Bend and southern Eagletail Mountains, Maricopa and Yuma Counties, Arizona. ● - unit Tb; ○ - unit Tm; △ - felsic volcanic rocks (Tf, Tfv, Tt); ■ - unit Tg; □ - unit Tmd; ⬡ - unit YXgn. Classification scheme for volcanic rocks from Le Bas and others (1986). Map symbols A-S reported in Gilbert and Spencer (1992) and Gilbert and others (1992), symbols T-DD in this report.

Table 1

MAP SYMBOLS

	Contact
	Fault, dashed where approximate, dotted where concealed
	Strike and Dip of Bedding
25	inclined
⊕	horizontal
	vertical
	Strike and Dip of Foliation
	inclined
(1)	Mineral deposit locality
	Major-element oxide sample locality
(Y)	Locality of age dating sample and major-element oxide sample
93 WG-48 □	Locality of age dating sample
	Felsic dike (Tdf)
	Mafic to intermediate dike (Tdm)

Table 2- Prospect Geochemistry

Map No.	R. No.	Au (ppb)	Ag (ppm)	As (ppm)	Bi (ppm)	Cu (ppm)	Hg (ppm)	Mo (ppm)	Pb (ppm)	Sb (ppm)	Zn (ppm)
1	93WG36	4070	0.4	4	2	15	<1	2	2	<2	12
2	93WG44	0.550 opt	0.4	2	<2	14	<1	7	6	<2	4
3	93WG40	1540	<0.2	102	<2	>10000	<1	13	150	<2	168
4	93WG39	30	0.2	4	2	27	<1	15	2	<2	2
5	93WG54	15	5.2	8	<2	>10000	<1	6	50	<2	62
6	93WG53	<5	7.6	44	14	68	<1	11	>10000	<2	>10000
7	93WG51	3360	0.6	4	<2	26	<1	4	6	<2	14
8	93WG50	<5	0.2	2	<2	10	<1	1	100	<2	78

(1) Three pits with gently NE-dipping shattered and brecciated iron-stained quartz vein up to 0.7 m thick .

(2) Trenches expose N-S-trending hematitic quartz vein.

(3) Trench exposes 5-10cm-thick, gently SW-dipping, chrysocolla-quartz vein in iron-stained Tg a few meters NE of contact with YXgn.

(4) Pit exposes 1.0 m-thick, fractured, hematitic quartz vein oriented 040, 60NW.

(5) Brick red, shattered YXgn. Bleached and altered, with malachite and chrysocolla along shears.

(6) Inclined shaft on 5 m-thick fault breccia dipping 70S in YXgn.

(7) 0-1 m-thick fractured, hematitic quartz vein oriented 045, 55SE in iron-stained shear zone.

(8) Crushed, iron-stained YXgn in fault zone.

Analyses by Chemex Labs, Inc., Sparks, Nevada

Table 3 (part 1). Major element oxide analyses from western and central Gila Bend Mountains and southern Eagletail Mountains, Yuma and Maricopa Counties, Arizona.

Rock Unit	Tb				Tm							Tf	
Map Symbol	C	G	N	AA	D	H	P	Q	R	DD	CC	E	O
Sample #	91WG33b	2-6-92-1	CFB	93WG28	11-18-91-5	92WG16	91-32	91-27	92WG104	93WG30	93WG32	11-21-91-6	CWPP
Laboratory	CH	CH	ACME	CH	CH	CH	ACME	ACME	CH	CH	CH	CH	ACME
Quadrangle	NB	COP	COP	YMB	NB	COP	HNE	HNE	HNE	CRP	CRP	NB	COP
SiO_2	49.50	46.95	52.57	52.10	57.71	48.13	57.29	56.20	52.50	58.98	64.61	67.63	64.41
TiO_2	1.15	1.13	1.04	1.27	0.82	1.24	0.88	0.94	1.02	1.28	0.67	0.34	0.47
Al_2O_3	15.50	14.72	16.98	16.62	16.38	17.32	16.70	16.53	17.05	16.54	16.22	15.79	15.79
Fe_2O_3	9.30	9.51	8.63	8.49	6.36	10.50	6.90	7.89	8.92	6.76	3.82	2.91	3.57
FeO	0.39	6.05	--	--	4.19	2.24	--	--	4.66	--	--	2.07	--
MgO	8.30	10.54	5.39	5.75	3.55	3.93	3.03	3.74	4.75	1.91	0.63	1.05	1.56
MnO	0.14	0.15	0.13	0.14	0.12	0.15	0.08	0.09	0.14	0.11	0.03	0.06	0.07
CaO	8.18	10.65	7.74	8.08	6.55	9.40	4.84	6.24	7.63	5.09	2.99	1.69	2.81
Na_2O	3.38	3.01	3.60	3.68	3.78	2.97	4.19	3.68	3.84	4.31	4.10	3.36	3.63
K_2O	1.64	1.04	1.18	1.71	2.54	1.18	2.34	0.99	1.58	2.61	3.71	6.25	4.41
P_2O_5	0.48	0.63	0.26	0.32	0.33	0.34	0.20	0.19	0.33	0.29	0.19	0.22	0.19
LOI	0.65	0.40	2.20	0.69	1.80	3.46	3.10	3.20	0.67	1.85	2.23	1.23	3.00
Cr_2O_3	--	--	0.017	0.02	--	0.03	0.002	0.022	0.01	<0.01	<0.01	--	0.002
BaO	0.08	0.08	--	--	0.10	--	--	--	--	--	--	0.19	--
Total	98.30	98.80	99.74	98.87	100.05	98.65	99.55	99.55	98.42	99.74	99.21	100.70	99.63
Comments													

-- Not Analyzed

Laboratory: CH - Chemex Labs, Ltd.; ACME - ACME Analytical Labs.; BC - Bondar-Clegg, Inc.

Quadrangle: COP - Columbus Peak; CRP - Cortez Peak; NB - Nottbusch Butte; HNE - Hyder NE; YMB - Yellow Medicine Butte

Samples T-DD located on map in this report; samples A-S located in Gilbert and Spencer (1992) and Gilbert and others (1992).

Table 3 (part 2). Major element oxide analyses from western and central Gila Bend Mountains and southern Eagletail Mountains, Yuma and Maricopa Counties, Arizona.

Rock Unit	Tfv		Tdf	Tt	Tg						
Map Symbol	F	I	X	BB	A	B	J	K	M	T	U
Sample #	91WG96a	92WG13	GD-RHY	93WG31a	91WG46	91WG12	92WG74	9174	90117	93WG46	GD-13b
Laboratory	CH	CH	BC	CH	CH	CH	CH	ACME	ACME	CH	BC
Quadrangle	NB	HNE	CRP	CRP	NB	NB	COP	COP	COP	CRP	CRP
SiO_2	67.86	66.35	73.56	75.68	72.47	70.30	68.31	78.37	70.73	69.86	67.45
TiO_2	0.38	0.34	0.08	0.18	0.23	0.27	0.35	0.11	0.36	0.30	0.37
Al_2O_3	15.01	14.52	13.46	10.88	14.01	14.15	15.32	12.59	13.96	14.84	15.09
Fe_2O_3	2.67	2.58	0.51	1.48	1.80	2.11	2.77	0.73	2.57	2.25	0.49
FeO	1.04	0.29	0.19	--	0.52	0.17	0.85	--	--	--	0.38
MgO	1.04	1.03	0.13	0.66	0.48	0.73	1.11	0.13	1.24	0.74	1.10
MnO	0.06	0.05	0.03	0.02	0.05	0.05	0.05	0.01	0.06	0.05	0.03
CaO	2.61	2.46	0.60	1.14	1.14	0.65	2.45	0.60	2.84	2.04	3.42
Na_2O	4.20	3.42	5.20	0.94	3.74	2.22	4.25	3.29	4.02	3.94	5.64
K_2O	3.39	4.17	5.30	5.81	5.02	8.33	3.98	3.80	2.77	4.32	2.51
P_2O_5	0.18	0.19	0.13	0.03	0.14	0.16	0.19	0.01	0.14	0.10	0.22
LOI	2.98	5.30	0.70	3.64	0.46	1.06	0.58	0.30	1.00	0.77	1.30
Cr_2O_3	<0.01	<0.01	--	0.01	--	--	--	0.002	0.006	0.02	--
BaO	--		--	--	--	0.15	0.19	0.14	--	--	--
Total	100.40	100.40	99.89	100.45	99.69	100.20	99.49	98.00	99.70	99.23	98.00
Comments				K/Ar sample				Aplite dike	K/Ar sample		

-- Not Analyzed

Laboratory: CH - Chemex Labs, Ltd.; ACME - ACME Analytical Labs.; BC - Bondar-Clegg, Inc.

Quadrangle: COP - Columbus Peak; CRP - Cortez Peak; NB - Nottbusch Butte; HNE - Hyder NE

Samples T-DD located on map in this report; samples A-S located in Gilbert and Spencer (1992) and Gilbert and others (1992).

Table 3 (part 3). Major element oxide analyses from western and central Gila Bend Mountains and southern Eagletail Mountains, Yuma and Maricopa Counties, Arizona.

Rock Unit	Tmd			YXgn		
Map Symbol	L	V	W	S	Y	Z
Sample #	88-1	L-5	89-4	92WG102	92WG42	93WG47
Laboratory	BC	BC	ACME	CH	CH	CH
Quadrangle	COP	CRP	CRP	HNE	CRP	YMB
SiO_2	59.95	51.03	54.10	69.95	69.68	67.36
TiO_2	0.73	1.14	1.03	0.30	0.31	0.45
Al_2O_3	16.89	17.48	15.73	16.02	15.79	16.69
Fe_2O_3	5.33	3.79	7.21	2.77	2.52	4.13
FeO	--	3.46	--	1.40	--	--
MgO	2.27	4.74	7.39	0.99	0.72	1.00
MnO	0.08	0.13	0.15	0.05	0.04	0.04
CaO	4.15	8.10	6.17	3.12	2.46	3.50
Na_2O	4.46	4.05	3.31	4.50	4.45	4.97
K_2O	3.44	1.85	2.74	2.49	3.29	1.62
P_2O_5	0.35	0.54	0.26	0.16	0.09	0.11
LOI	2.00	1.60	1.50	0.54	0.94	0.75
Cr_2O_3	0.002	--	0.039	0.02	0.02	0.02
BaO	--	--	--	--	--	--
Total	99.65	97.91	99.59	100.90	100.30	100.65
Comments					K/Ar sample	K/Ar sample

-- Not Analyzed

Laboratory: CH - Chemex Labs, Ltd.; ACME - ACME Analytical Labs.; BC - Bondar-Clegg, Inc.

Quadrangle: COP - Columbus Peak; CRP - Cortez Peak; NB - Nottbusch Butte; HNE - Hyder NE

Samples T-DD located on map in this report; samples A-S located in Gilbert and Spencer (1992) and Gilbert and others (1992).