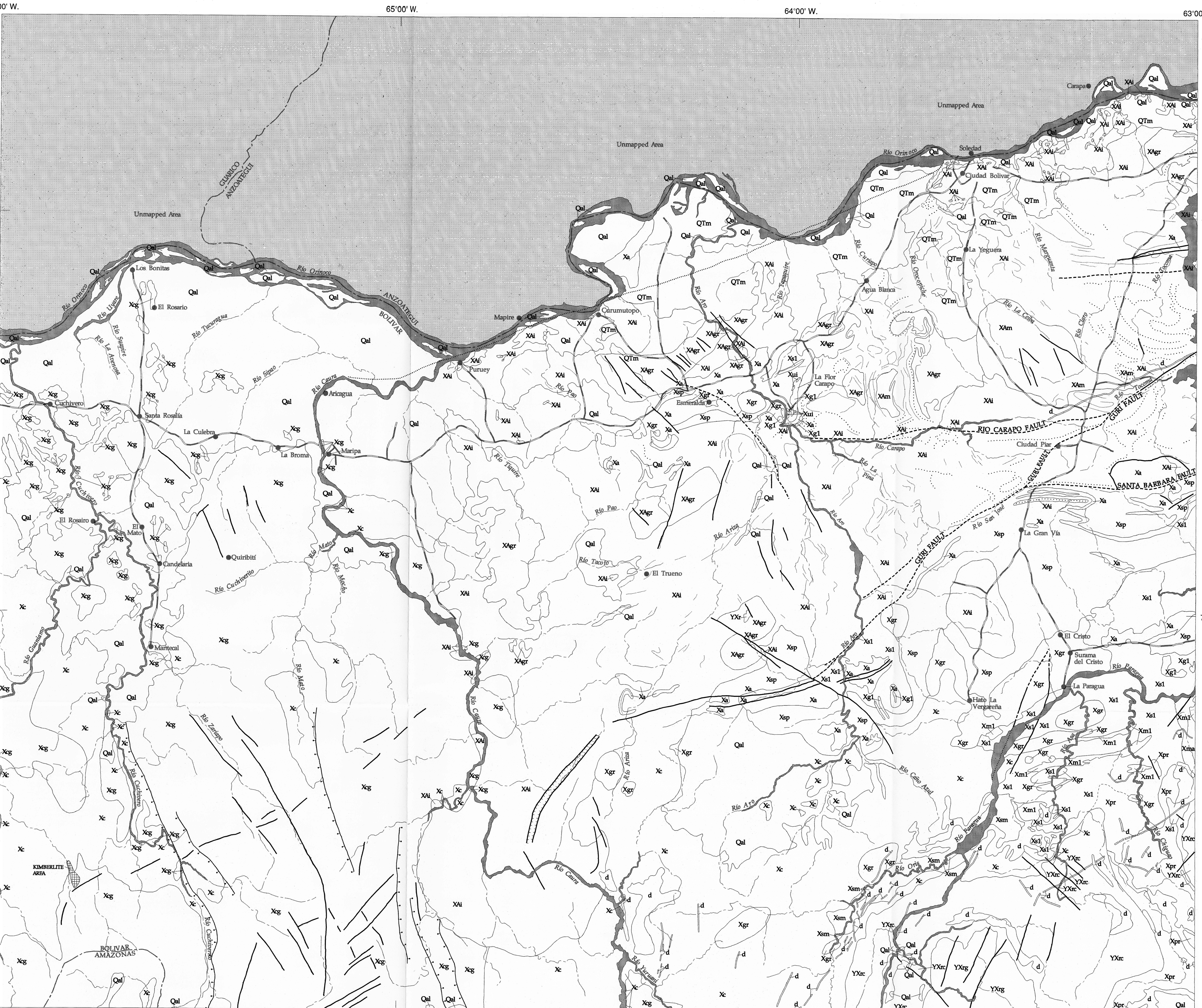
U.S. DEPARTMENT OF THE INTERIOR
U.S. GEOLOGICAL SURVEY

Prepared in cooperation with the
CORPORACION VENEZOLANA DE GUAYANA, TÉCNICA MINERA, C.A.

MISCELLANEOUS FIELD STUDIES
MAP MF–2246



Base from C.V.G., Técnica Minera, C.A., Map no. NB 20–1, 1990

Equidistant Conic Projection based on standard parallels 4° N. and 9° N. and central meridian 66° W.

SCALE 1:500 000

10 0 10 20 30 40 50 60 70 80 90 KILOMETERS

10 0 10 20 30 40 50 MILES

INTERIOR—GEOLOGICAL SURVEY, RESTON, VA—1994

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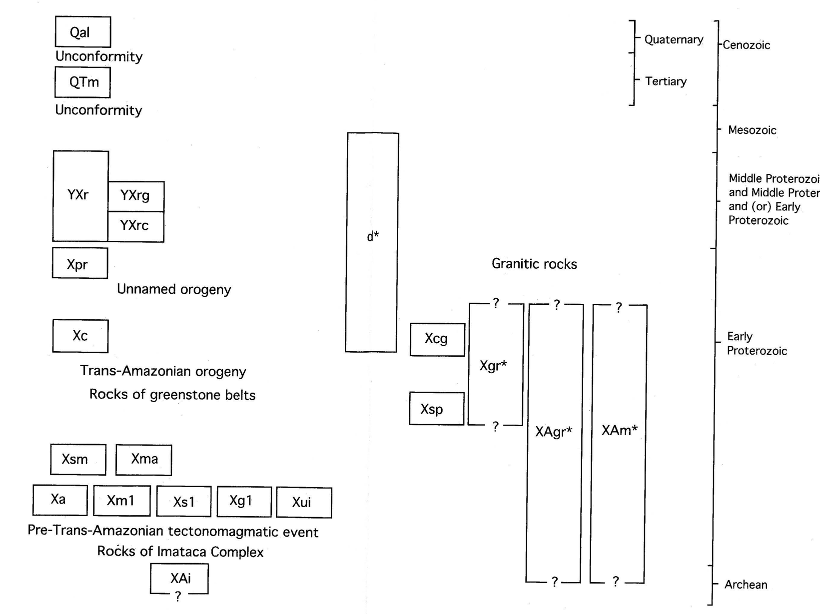
CORRELATION OF MAP UNITS



*See description of map units for exact ages and relations with other units

DESCRIPTION OF MAP UNITS

Qal	**Alluvial deposits (Quaternary)**--Sand, silt, clay, and gravel
QTm	**Mesa Formation (Pleistocene and Pliocene)**--Siltstone and sandy siltstone, generally reddish color; massive to laminated. Unconsolidated gravel and sand in upper part
d	**Diabase (Mesozoic or Early Proterozoic)**--Dark-gray to greenish-gray, fine- to coarse-grained, tholeiitic, some disseminated pyrite. Occurs as dikes, sills, and laccoliths. On the basis of isotopic dating throughout the Guayana Shield, includes diabase of about 1,650 Ma, and possibly as old as 1,850 Ma, as well as diabase about 210 to 200 Ma (Sidder and Mendoza, 1991)
	Roraima Group (Middle and Early Proterozoic)--Largely siliciclastic rocks that regionally are as much as 3,000 m thick. Commonly weathers to form high tepuys (flat-topped mesas) and ledge and slope topography. On the basis of isotopic dating in the Guayana Shield, some strata are at least 1,650 Ma, but the possible age of the entire group ranges from 1,900 to 1,545 Ma (Sidder and Mendoza, 1991)
YXr	**Undivided part**--Quartz arenite, arkose, silty arenite, conglomeratic arenite, conglomerate, siltstone, and shale; cross-stratified, laminated, or massive. Divided regionally by Yánez (1985) into the Auyantepuy, the Guaiquinima, and the Canaima Formations. In the map area, only the lower two formations crop out
YXrg	**Guaiquinima Formation**--Fine-grained quartz arenite and arkose, cross-stratified, laminated, and massive; siltstone and graywacke; red, green, and greenish-gray jasper composed of devitrified and (or) silicified ash and small crystals of quartz and feldspar. Weathers to form flat or gently sloping topography. Upper part largely covered with debris from overlying Auyantepuy Formation. Several hundred meters thick. Equivalent to all but the lowermost part of the Uaimapué Formation of Reid (1974)
YXrc	**Canaima Formation**--Quartz arenite and arkose, conglomeratic arenite, conglomerate, siltstone, and shale. Abundant crossbedded strata in arenite and arkose units. Weathers to form cliffs on resistant arenite, arkose, and conglomerate units and weathers to form slopes on relatively nonresistant siltstone, shale, and silty arenite units. About 1,100 to 2,000 m thick (Yánez, 1985). Equivalent to Uairén and Cuquenán Formations and lowermost part of Uaimapué Formation of Reid (1974)
Xpr	**Pre-Roraima Group sedimentary rocks of Briceño (1982) (Early Proterozoic)**--Fine- to very fine grained, clay-rich sandstone, locally containing granule-size quartz grains, interbedded with red shale and sandy shale (Briceño, 1982). Probably unconformably below Roraima Group
Xc	**Volcanic rocks of Cuchivero Group (Caicara Formation) (Early Proterozoic)**--Rhyodacitic to rhyolitic tuff, some crystal- and lithic-rich parts; rhyodacite porphyry; andesite and basalt lava flows, commonly hydrothermally altered; rhyodacite granophyre; local mylonite. Weakly metamorphosed. About 1,980 to 1,790 Ma (Sidder and Mendoza, 1991; Brooks and others, in press)

GREENSTONE BELT ROCKS
(2,250 to 2,100 Ma, Sidder and Mendoza, 1991)

Xsm	**Sedimentary and metasedimentary rocks (Early Proterozoic)**--Rocks of uncertain affinity along or near Río Oris in southeastern part of quadrangle. Corresponds in part with La Quina Formation of Bellizzia and others (1976a). Hematitic quartz arenite; reddish phyllitic siltstone; feldspathic arenite; conglomeratic arenite; quartz-sericite phyllite; red, laminated, fine-grained meta-arenite with graded bedding and erosional channels
Xma	**Maracapra Formation of Bellizzia and others (1976a) (Early Proterozoic)**--Weakly metamorphosed red beds and felsic volcanic rocks
Xa	**Amphibolite schist (Early Proterozoic)**--Includes local coarse-grained metagabbro
Xm1	**Mafic to intermediate metalava and metatuff (Early Proterozoic)**--Mainly greenstone and schist, but locally includes amphibolite and hornblende hornfels near granitic contacts
Xs1	**Schist, phyllite, metatuff, and metavolcanic rocks (Early Proterozoic)**--Quartz-mica schist; quartz-sericite-chlorite schist; sericitic meta-arenite; sericitic-chloritic phyllite; rhyolitic, dacitic, andesitic, and basaltic metatuffs; minor metabasalt and meta-andesite
Xg1	**Gabbro (Early Proterozoic)**--Includes both metamorphosed and unmetamorphosed gabbro
Xui	**Ultramafic intrusive rocks in La Flor-Carapo area (Early Proterozoic)**--Medium- to coarse-grained pyroxenite sills; ophitic or subophitic to commulate textures; saussuritized plagioclase, clinopyroxene altered to green hornblende, and sparse olivine

ROCKS OF THE IMATACA PROVINCE

XAi	**Imataca Complex (Archean)**--Amphibolite- to granulite-facies quartzofeldspathic orthogneiss and paragneiss, commonly garnet-bearing, and felsic granulite. Minor amounts of intermediate to mafic orthogneiss, granulite, and charnockite. Metamorphosed iron formation and ferruginous quartzite are shown by dotted lines on map. Older than 2,800 Ma, protolith probably as old as 3,700 to 3,400 Ma (Sidder and Mendoza, 1991)

GRANITIC ROCKS

Xgr	**Granitic rocks (Early Proterozoic)**--Mostly quartz monzonite. Porphyritic, medium- to coarse-grained, some inclusion of granodiorite. May include potassic granitoids as old as the Supamo Complex (similar to those in the Guri 2° X 3° quadrangle to the east, Klar, 1979) and (or) granitoids as young, or younger than, the Cuchivero Group
XAgr	**Granitic rocks intruding the Imataca Complex (Early Proterozoic and (or) Archean)**--Mostly quartz monzonite. Age uncertain; may include granitoids as old as Late Archean as well as granitoids of Early Proterozoic age equivalent to the Supamo or Cuchivero Groups
XAm	**Migmatite and gneiss associated with the Imataca Complex (Early Proterozoic and (or) Archean)**--Quartz monzonite, migmatite, and lineated gneiss
Xcg	**Granitic rocks of the Cuchivero Group (Early Proterozoic)**-- Hypabyssal biotite granite, quartz monzonite, and granodiorite, equigranular to porphyritic, medium- to coarse-grained. About 1,930 to 1,790 Ma (Sidder and Mendoza, 1991)
Xsp	**Supamo Complex (Early Proterozoic)**--Sodic granitic rocks, paragneiss, migmatite, granodiorite, and sparse pegmatite. About 2,230 to 2,050 Ma (Sidder and Mendoza, 1991)

EXPLANATION OF MAP SYMBOLS

- Contact
- Fault--Bar and ball on downthrown side; dashed where inferred; dotted where concealed. Includes lineaments recognized on Side-Looking Airborne Radar
- Graben-bounding fault--Ticks on downthrown side
- Banded iron formation and quartzite of the Imataca Complex
- Area containing scattered kimberlite dikes and sills in south-western part of quadrangle; isotopic ages from 2,060 to 1,900 Ma by Rb/Sr and Nd model methods (Nixon, 1988; Nixon and others, 1989)
- Linear, curvalinear, to circular structural features recognized on Side-Looking Airborne Radar

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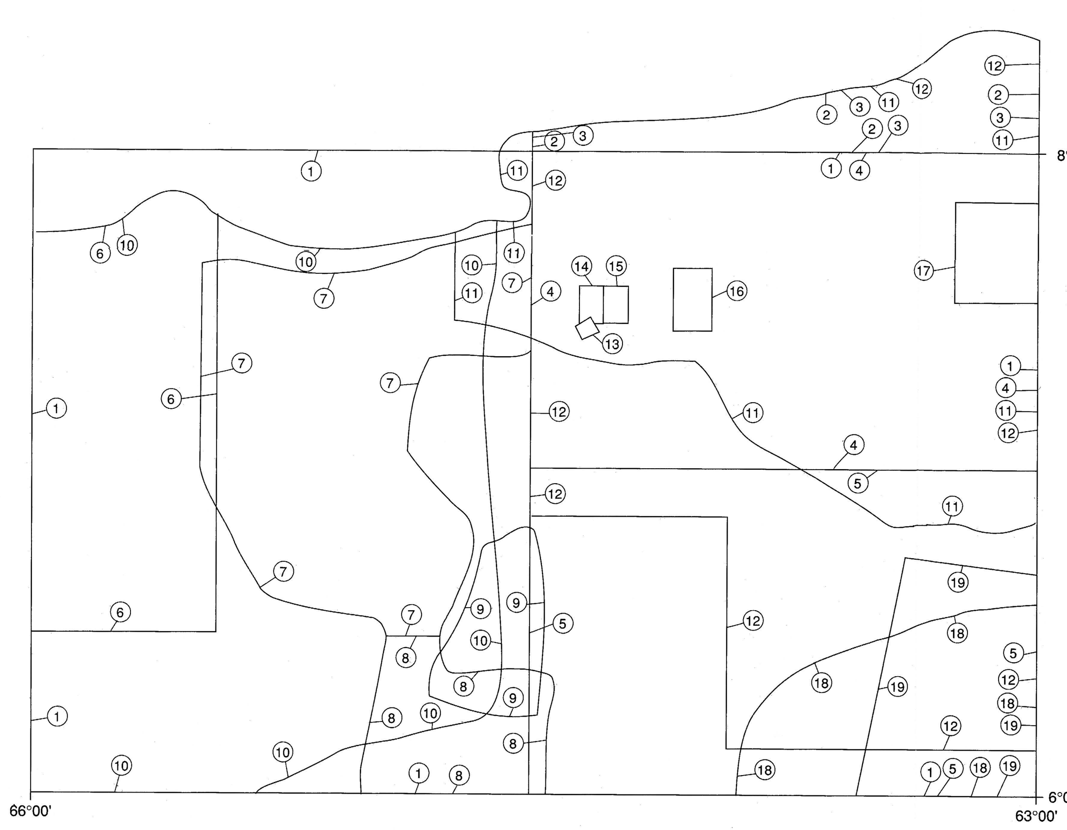
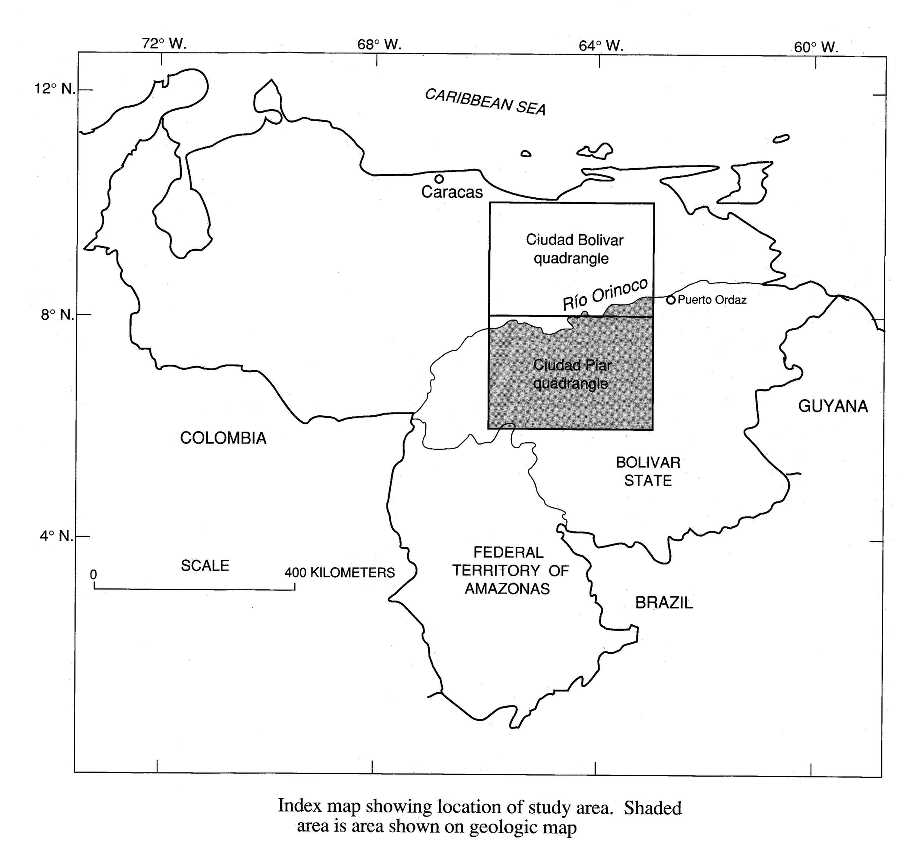


SOURCES OF GEOLOGIC MAPPING

1 Bellizzia and others (1976a)
2 Bellizzia and others (1976b)
3 Corporación Venezolana de Guayana, Técnica Minera, C.A., unpub. map of quadrangle NC 20-14, scale 1:250,000.
4 Corporación Venezolana de Guayana, Técnica Minera, C.A., unpub. map of quadrangle NB 20-2, scale 1:250,000.
5 Corporación Venezolana de Guayana, Técnica Minera, C.A., unpub. map of quadrangle NB 20-6, scale 1:250,000.
6 Rios (1972)
7 Tepedino (1972a)
8 Tepedino (1972b)
9 Olmore and Estanga (1989)
10 McCandless (1965)
11 Kalliokoski (1965)
12 Martín (1979)
13 Ramón Olivares, 1991, unpub. thesis map, scale 1:25,000
14 W.C. Day, G.B. Sidder, and others, 1991, unpub. geologic map. See also Sidder and others (1991).
15 Freddy Prieto, 1989, Técnica Minera, Informe, unpub. map
16 L. Guilloux and B. Pollet, 1989, Mapa geológico y estructural de La Flor-Carapo: Técnica Minera, C.A., unpub. map, scale 1:25,000.
17 Dougan (1967)
18 Yánez (1985)
19 Briceño (1982)



Index map showing location of study area. Shaded area is area shown on geologic map

GEOLOGIC MAP OF THE CIUDAD PIAR AND PART OF THE CIUDAD BOLIVAR 2°×3° QUADRANGLES, BOLIVAR STATE, VENEZUELA

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