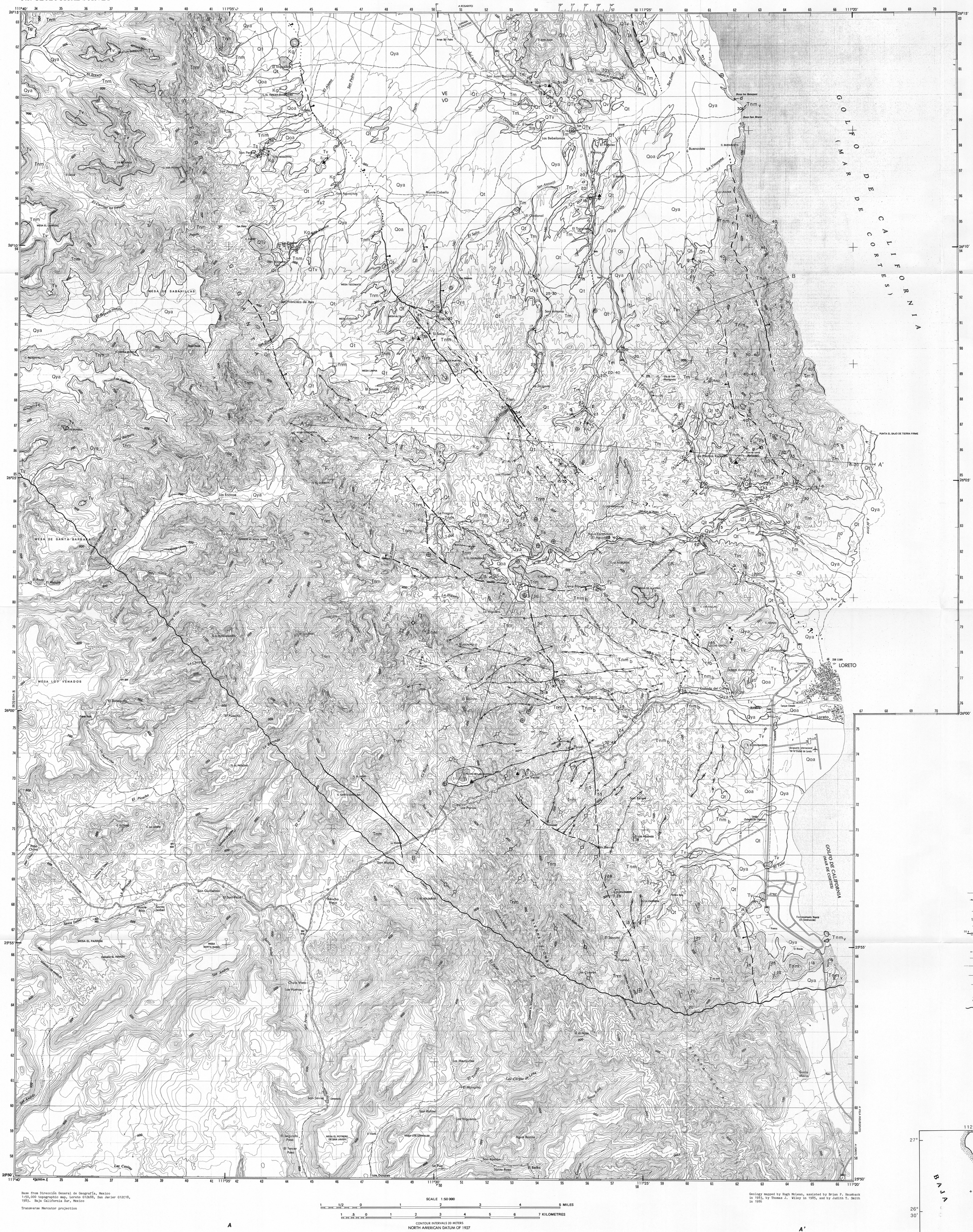
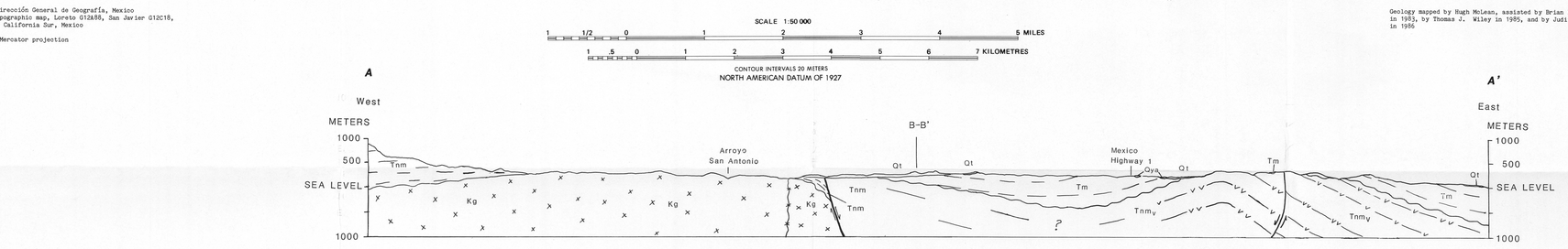
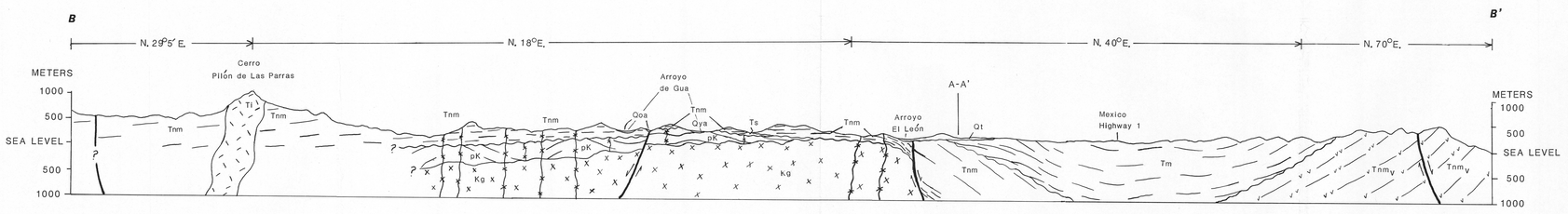
DEPARTMENT OF THE INTERIOR
U.S. GEOLOGICAL SURVEY

PREPARED IN COOPERATION WITH
THE CONSEJO DE RECURSOS MINERALES DE PATRIMONIO Y FOMENTO
INDUSTRIAL DE LOS ESTADOS UNIDOS MEXICANOS

MISCELLANEOUS FIELD STUDIES
MAP MF-2000

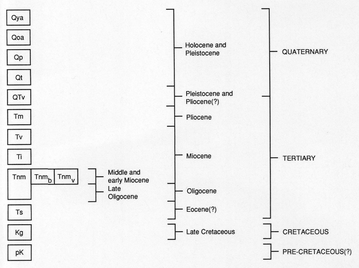






NO VERTICAL EXAGGERATION

CORRELATION OF MAP UNITS



DESCRIPTION OF MAP UNITS

Qya **Younger alluvial deposits (Holocene and Pleistocene)**--Unconsolidated to poorly consolidated cobble and pebble gravel, sand, and silt of presently active stream channels

Qoa **Older alluvial deposits (Holocene and Pleistocene)**--Unconsolidated to poorly consolidated cobble and pebble gravel, sand, and silt of middle-level terrace deposits of abandoned stream courses

Qp **Pyroclastic deposits (Holocene and Pleistocene)**--Reddish-brown, loosely consolidated volcanic ejecta consisting of ropy and angular lapilli, bombs, and blocks that overlie units Qt and Tm

Qt **Terrace deposits (Holocene and Pleistocene)**--Moderately consolidated, poorly sorted conglomerate and sandstone. Deposits form a horizontal to gently dipping alluvial veneer and are dissected by presently active stream channels. Clasts are mainly volcanic, but may include locally derived granitic and prebatholitic metamorphic rocks

QTv **Lava flows (Pleistocene and Pliocene?)**--Dark-gray, reddish-brown weathering, fine-grained sparsely phyric andesite and basaltic andesite lavas. Called the Comondú Formation by Chavez (1978)

Tm **Marine rocks of the Loreto embayment (Pliocene)**--Reddish-brown nonmarine mudstone and grayish nonmarine conglomerate grade upward into, and interfinger with, marine section consisting of light-gray, yellow, and brown, moderately consolidated to well-indurated, sandstone, siltstone, conglomerate, and coquina. Grayish-white and light grayish-yellow tuff and lapilli-tuff are interbedded with marine strata. Marine beds contain well-preserved oysters and pectens and less abundant brachiopods, internal molds of bivalves, strombid gastropods, barnacles, and rare coral fragments. Microfossils include foraminifera, diatoms, and ostracodes. Includes some Pleistocene(?) coquina that contains echinoid fragments as well as bivalve and gastropod material. Fossils and K-Ar ages indicate Pliocene age. Called Salada Formation by Beal (1948), Mina (1957), and Chavez (1978); and called San Marcos, Carmen, and Marquer Formations by Anderson (1950) and Durham (1950)

Tv **Lava flows (Miocene)**--Very dark gray, reddish-brown weathering lava flows that in Sierra La Giganta overlie lower and middle Miocene nonmarine sedimentary rocks. Sparse phenocrysts include plagioclase, hypersthene, and augite in andesitic rocks, and plagioclase and olivine in basaltic rocks. Called Comondú Formation by Beal (1948), Mina (1957), and Chavez (1978)

Reddish-brown and grayish-brown flow-banded lava in the coastal hills contain abundant large plagioclase phenocrysts and accessory oxyhornblende, hypersthene, biotite, apatite, and opaque oxides. Called Comondú Formation by Beal (1948) and Mina (1957) and called Huertitas Formation by Chavez (1978)

Ti **Hypabyssal rocks (early Miocene)**--Light-gray, medium-grained, hypabyssal hornblende andesite porphyry. Hornblende yields K-Ar age of 19 Ma (table 1, No.5; Hausback, 1984)

Volcanic and volcaniclastic Complex (middle and early Miocene, and late Oligocene)--Divided into:

Tnm **Volcaniclastic rocks (middle and early Miocene, and late Oligocene)**--Basal 100 to 200 m consists of several distinctive intertonguing lithofacies of mixed provenance that depositionally overlie granitic and metamorphic basement rocks, and quartzose sandstone.

Sandstone along the upper part of Arroyo de Gua overlies metamorphic rocks and consists of greenish-gray, moderately indurated, medium- to coarse-grained sandstone, and siltstone composed of altered plagioclase, epidote, altered volcanic rock fragments, fresh andesitic rock-fragments, and clinopyroxene.

Sandstone in Arroyo El León consists of grayish-red, and grayish-brown, well-indurated, medium- to coarse-grained, impure pelletoidal phosphatic sandstone.

Sandstone in the upper part of Arroyo El Salto consists of reddish-brown and grayish-red, well-indurated, sandstone composed mainly of quartz, plagioclase, microcline and rare phosphate pellets. Interbedded welded ash-flow tuffs yield K-Ar ages of 21 and 22 Ma.

Beds of mixed provenance grade upward into 1,000 to 1,400 m of brownish-gray, gray, and yellowish-brown, moderately to well-indurated volcaniclastic sandstone, siltstone, and polymict andesitic conglomerate and breccia distributed widely in Sierra La Giganta. Massive lenticular beds, poorly sorted conglomerate lenses, and absence of fossils suggest nonmarine deposition in environment of coalescing alluvial fans. Called Comondú Formation by Beal (1948), and Mina (1957), and called the Huertitas and Comondú Formations by Chavez (1978)

Tnm_v **Near-vent volcanic facies (middle and early Miocene?)**--Largely consists of andesitic conglomerate and breccia, and volcaniclastic sandstone that interfingers upward with gray- and grayish-brown porphyritic andesite and dacite lava flows. Forms ragged hills along coast between Arroyo Arce and Arroyo San Juan, and probably represents a near-vent facies of unit Tnm. Massive beds of polymict conglomerate, and breccia consist mainly of different textural varieties of hornblende andesite and other intermediate composition volcanic rocks. Called the Comondú Formation by Beal (1948), Anderson (1950), Mina (1957), and Chavez (1978)

Tnm_b **Breccia sequence and dike swarm (middle and early Miocene)**--Complexly faulted polymict andesitic breccia and volcaniclastic sandstone that crops out in low hills west of Loreto along Arroyo La Parras and tributaries. A swarm of andesitic dikes intrudes sequence that contains a polymict assemblage of hornblende and pyroxene andesite. Stratigraphic relation with other units not well known, but appears to grade westward into unit Tnm, and grade eastward into unit Tnm_v. Called Comondú Formation by Beal (1948), and Mina (1957), and called Huertitas Formation by Chavez (1978)

Ts **Quartzose sandstone (Eocene?)**--White, and reddish brown, trough-cross-bedded, quartzose sandstone that overlies prebatholitic rocks in upper part of Arroyo de Gua and overlies granitic rock elsewhere. Age uncertain, although regional stratigraphy suggests Eocene age. Thickness approximately 50 to 75 m. Queried where mapped by interpretation of aerial photographs and not field checked

Kg **Granitic rocks (Late Cretaceous)**--Gray and light-gray, salt-and-pepper colored, fine- and medium-grained biotite quartz monzonite, and biotite granodiorite. Locally intrudes prebatholithic volcaniclastic strata and associated andesitic dikes. Overlain by Tertiary and Quaternary strata. K-Ar dating indicates Cretaceous age

pK **Prebatholitic rocks (pre-Cretaceous)**--Highly indurated, nonfoliated volcaniclastic sandstone and pebble conglomerate and hornblende andesite dikes metamorphosed to greenschist facies. Dikes characterized by large euhedral hornblende phenocrysts. Metamorphic mineral assemblage consists of albite, epidote, chlorite, and quartz, which imparts greenish gray color. A K-Ar dating indicates a minimum age of 94 Ma. Unit not mapped by previous workers

EXPLANATION

Contact

Dike

Strike and dip of beds
- Inclined
- Horizontal
- Uncertain-Dip value absent where orientation estimated from aerial photograph
- Vertical

High-angle fault—Dashed where approximately located; queried where doubtful; dotted where concealed; bar and ball on downthrown side; arrow shows dip direction; in cross section parallel half arrows show relative movement

Lineation—Formed by flowbanding in lava

Vertical lineation

Anticline—Dashed where approximately located; dotted where concealed; queried where uncertain

Syncline—Dashed where approximately located

Paleocurrent flow direction—Direction of plunge of cross stratification in sandstone

Sample location
- K-Ar locality—Number refers to map number in table 1
- Fossil locality—Letter refers to map location symbol in table 2

Approximate boundary of mapped area

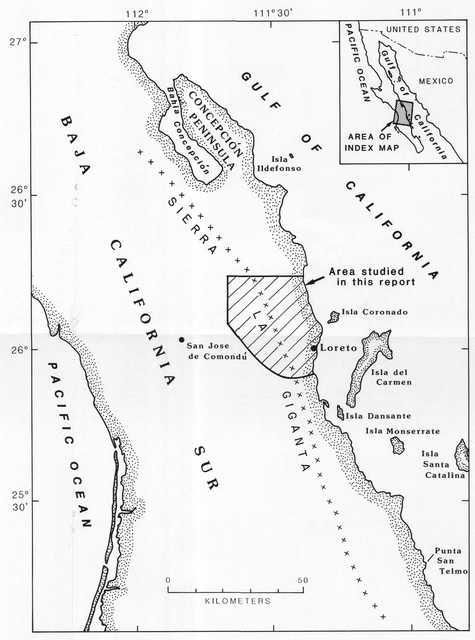


Figure 1. Index map showing location of study area.

RECONNAISSANCE GEOLOGIC MAP OF THE LORETO AND PART OF THE SAN JAVIER QUADRANGLES, BAJA CALIFORNIA SUR, MEXICO

By

Hugh McLean

1988

Explanatory pamphlet accompanies map

Interior—Geological Survey, Reston, VA—1988

For sale by U.S. Geological Survey, Map Distribution, Box 25286, Federal Center, Denver, CO 80225