

QTmr Mariana limestone (Pliocene and **Pleistocene)**—White, dense, inequigranular, predominantly detrital facies, representing a reef platform and off-reef variety of environments. Coralgal framework, molluscan and Halimeda subfacies locally important. Completely recrystallized, and commonly displays vuggy to cavernous porosity. Dominant rock unit throughout much of northern Guam where it attains thicknesses estimated at between 550 and 600 ft. Major source of

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QTma Hagatna argillaceous member (Pliocene and Pleistocene)—coarse-to fine-grained paleyellow, tan, or brown fossiliferous detrital limestone containing 2 to 5 percent disseminated clay and as much as 20 percent clay in pockets and cavities; includes undifferentiated lenses of other Limestone facies. Formation typically unconformable upon underlying rocks. Maximum aggregate thickness of formation is as much as 500 feet in some cliffs

Alifan limestone (Miocene and Pliocene)— Massive coarse-to fine-grained recrystallized limstone generally pale pink, buff, or white but locally red, yellow, or brown. Characterized by dominance of sticklike Porites and Acropora and by long calcite tubes formed by burrowing worms or gastrpods. Locally argillaceous above base. Maximum estimated thickness of the Alifan limestone is 150 feet

Talisay member (Miocene)—yellow, green, and red clay and lenticular clayey conglomerate and lignite; gray to green marl containing sticklike Porites and Acropora, and interbedded limestone lenses, 2 to 30 feet thick

Barrigada, Bonya and Janum limestones (Pliocene and Miocene)—Detrital limestones: Janum, pink to tan, somewhat friable, deep-water facies with abundant pelagic forams. Bonya limestone, white, compact, sometimes sandy, well-bedded biomicrite, benthic forams abundant. Frequently displays manganese mineralization. Barrigada limestome, a dead-white, compact to chalky biomicrite featuring coralline red algae, Halimeda, benthic forams as well as corals near the upper contact with the Mariana limestone

Maemong limestone formation (Miocene)—reef facies in central Guam consists of compact white recrystallized limestone containing larger Foraminifera and algae, and corals in position of growth; at some places overlain by the Bolanos pyroclastic member. Outcrop distribution restricted generally to several prominent wooded knolls in the upper Talofofo River valley, many lying within the Talofofo Golfing Resort. The estimated outcrop thickness of the Maemong limestone ranges from less than 10 feet to about 150 feet, although the elevation of the base of the unit is not apparent

Umatac formation (Oligocene-Miocene) Aggregate thickness of formation about 2200 feet

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Umatac formation undifferentiated (Miocene)unresolved stratigraphic sequences in Umatac formation that encompass sections of Tub, Tug, and/or Tus. Approximate thickness ranges from 200 to 500 feet Dandan flow member (Miocene)—compact

Tu

- medium- to coarse-grained porphyritic andesite flows separated from the underlying Bolanos pyroclastic member by a flow breccias approximately 10 feet thick; maximum thickness of member 50 feet
- Tub Bolanos pyroclastic member (Miocene)breccias, conglomerates, and sandstones consisting largely of fragmented andesite. These andesites typically have prominant euhedral augite phenocrysts up to 1 centimeter in length and millimeter-scale plagioclase phenocrysts. Limestone clasts are conspicuous in some breccias and conglomerates. Estimated thickness of the Bolanos pyroclastic member ranges from 750 to 1000 feet
- Tus Schroeder flow member (Miocene)—basaltic andesite pillow lava with plagioclase, augite and olvine phenocrysts. Volcanic sandstones consisting of clasts derived from the pillow lavas. Interbedded with the uppermost portion of the Schroeder flow member. Estimated thickness of the Schroeder flow member ranges from 100 to 400 feet
- Tug Geus River member (Oligocene)—interbedded limestones, sandy and tuffaceous limestones, sandstones and conglomerates. Clasts in sandy units are largely fragmented and altered andesitic volcanics, but also include intraformational limestones including reef limestones not seen in southwestern Guam. Conglomerates with clasts of basalts, andesites and dacites are considered to be near the base of Tug. Estimated thickness of the Geus River member ranges from 250 to 300 feet
- TamMahlac member of Alutom formation (Eocene and Oligocene)—thin-bedded to laminated friable buff to tan or yellow-tan calcareous formaminiferal shale; maximum known thickness 200 feet
- Ta Alutom formation (Eocene and Oligocene) bedded breccias, conglomerates, sandstones, turbidites, sandy limestones, and micritic to bioclastic limestones. Clasts in the breccias and conglomerates generally are two-pyroxene andesites, although rare olivine phyric basalts and hornblende andesite clasts also are present. Estimated thickness of the Alutom formation ranges from 1850 to 2000 feet
- Tf Facpi formation (Eocene)—basal portion consists of high-Ca boninite pillow lavas interbedded with pillow breccias, hyaloclastites, and sandstones of the same lithology. Least differentiated lavas have olivine, augite, and chromite phenocrysts; more differentiated varieties lack chromite and have plagioclase and orthopyroxene phenocrysts. The upper portion consists of pillow lavas, breccias, bedded breccias and conglomerates of arc tholeiitic basalt with olivine, augite, and plagioclase phenocrysts. Boninitic and basaltic dikes cut this formation and are particularly abundant in the region of the Facpi peninsula

MAP SYMBOLS



———— Fault—Solid where definitely located; dashed where approximately located; dotted where concealed Approximate site of numbered stratigraphic sections shown on accompanying sheet

COMPOSITE STRATIGRAPHIC SECTIONS

Composite stratigraphic sections showing probable vertical bedrock sequence. Maximum limestone section thicknesses, in feet, shown below in parentheses; formation abbreviations and color consistent with 2008 revision of 1:50,000 geologic map



			Radiometric			Volcanio	Mariana Islands					Palau	Yap Main Islands	
Peric	ods	Epochs	years bp (non-linear)	Plate Rotation	Plate Spreading	Ridge Evolution	Guam	Rota	Aguijan and Tinian	Saipan	Farallon de Medinilla	Northern Islands	Babelthuap Peleliu and Angaur Koror and Urukthape	Gagel-Tomil, Yap, Maap and Rumumg
NEOGENE)	Holocene	10 ⁶		ana Trough	volcanism Ige	Merizo limestone	Mirakatten limestone (Sugawara) Rota limestone				Island/submarine		
		Pleistocene			preading of the Mari	Island & submarine ild East Mariana Rid	Tarague limestone	Ponia limestone	Tanapag limestone Aguijan limestone (Tayama)	Tanapag limestone		volcanism		
	~	~~~~~~	1.6×10 ⁶				Mariana limestone	Mariana limestone	Mariana limestone	Mariana limestone	Unnamed limestone		Peleliu limestone	Garim limestone
		Pliocene		5-0 Ма: Sp	1.5-0 Ma: bu	Alifan limestone			Upper terrace gravels			Palau limestone Airai clay/lignite		
		~~~~~~	5×10 ⁶			arc					Unnamed limestone			
		Miocene		24-8 Ma: 35-deg. Clockwise rotation of the Philippine Sea Plate	30-17 Ma: Spreading of the Parece-Vela Basin	20-8 Ma: Submarine & subaerial volcanism Id the West Mariana Ridge, now a remnant	Janum limestone Barrigada limestone Talisay shale/lignite Bonya limestone Dandan basaltic andesite flows Bolanos tuffaceous breccia agglomerate flows Geus River limestone (upper) Schroeder volcanics		Tagpochau limestone	Fina-sisu basalt flows			Arakabesan andesite	Tomil volcanics   Map melange
		~~~~~~	25×10 ⁶		sin	pn	Maemong limestone Geus River limestone (lower)							
PALEOGENE		Oligocene		Clockwise rotation oine Sea Plate	hilippine Ba	nism builds emnant arc	Basaltic sill in Alutom formation	Ogo andesites					Ngeremlengui dacite Aimeliik andesite tuff	
		~~~~~~	37×10 ⁶		f West F	e volcai now a r	Mahlac shale Alutom volcanics and volcaniclastics			Matansa limestone				
		Eocene		8 Ma: 50-deg of the Philipp	a: Opening of	1a: Submarin yushu Ridge,	Basaltic dikes in Facpi formation	Sabana andesite	Unnamed volcaniclastic fm.	Densinyama fm. Hagman andesites				
	~	Paleocene	53×10 ⁶ 65×10 ⁶	>50-3	-40 M	2-32 N alau-K	Facpi formation			Sankakuyama rhyolite				Unnamed serpentine
		Cretaceous			>90	4 0								Yap schist/phyllite Unnamed perodotite



Umatac Mt. Schroeder Merizo area (Tug=300 feet)

	SYMBOLS
	Limestone
	Limestone, argillaceous
	Limestone, significant macrofossils
	Limestone, significant coralline framework
	Limestone, significant manganese
	Limestone, sedimentary and volcanic (tuffaceous)
	Globigerina limestone
	Mudstones, siltstones, and shale, sedimentary and volcanic (tuffaceous)
	Shale
	Cross-bedded strata
0.000	Coarse sands and gravel
	Conglomerate and agglomerate
	Breccia, sedimentary and volcanic (bedded and random)
	Lava flows (pillow lava)
<u>}}X}}XX</u>	Lava flows (non-pillow lava), (subaerial)
× × × × × ×	Sill
	Major fault
	Dike

Sections extrapolated from surface geology shown on revised 1:50,000 geologic map of Guam.

FORMATIONS OF HIGH ISLANDS ON THE PHILIPPINE S	SEA PLATE	