

U.S. Department of the Interior
National Park Service
Natural Resource Stewardship and Science Directorate
Geologic Resources Division



American Memorial Park

GRI Ancillary Map Information Document

Produced to accompany the Geologic Resources Inventory (GRI) Digital Geologic
Data for American Memorial Park

amme_geology.pdf

Version: 1/13/2022

Geologic Resources Inventory Map Document for American Memorial Park

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Geologic Resources Inventory Map Document



American Memorial Park, Saipan, Commonwealth of Northern Mariana Islands

Document to Accompany Digital Geologic-GIS Data

[amme_geology.pdf](#)

Version: 1/13/2022

This document has been developed to accompany the digital geologic-GIS data developed by the Geologic Resources Inventory (GRI) program for American Memorial Park, Saipan, Commonwealth of Northern Mariana Islands (AMME).

Attempts have been made to reproduce all aspects of the original source products, including the geologic units and their descriptions, geologic cross sections, the geologic report, references and all other pertinent images and information contained in the original publication.

This document contains the following information:

- 1) **About the NPS Geologic Resources Inventory Program** – A brief summary of the Geologic Resources Inventory (GRI) Program and its products. Included are web links to the GRI GIS data model, and to the GRI products page where digital geologic-GIS datasets, scoping reports and geology reports are available for download. In addition, web links to the NPS Data Store and GRI program home page, as well as contact information for the GRI coordinator, are also present.
- 2) **GRI Digital Map and Source Citation** – The GRI digital geologic-GIS map produced for this project along with the source used in its completion. In addition, a brief explanation of how the source map was used is provided.
- 3) **Map Unit List** – A listing of all geologic map units present on the map for this project, generally listed from youngest to oldest.
- 4) **Map Unit Descriptions** – Descriptions for all geologic map units.
- 5) **Geologic Cross Sections** – Geologic cross section graphics with source geologic cross section abbreviations.
- 6) **Ancillary Source Map Information** – Additional source map information.
- 7) **GRI Digital Data Credits** – GRI digital geologic-GIS data and ancillary map information document production credits.

For information about using GRI digital geologic-GIS data contact:

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About the NPS Geologic Resources Inventory Program

Background

The Geologic Resources Inventory (GRI) provides geologic map data and pertinent geologic information to support resource management and science-informed decision making in more than 270 natural resource parks throughout the National Park System. Geologic resources for management consideration include both the processes that act upon the Earth and the features formed as a result of these processes. Geologic processes include: erosion and sedimentation; seismic, volcanic, and geothermal activity; glaciation, rockfalls, landslides, and shoreline change. Geologic features include mountains, canyons, natural arches and bridges, minerals, rocks, fossils, cave and karst systems, beaches, dunes, glaciers, volcanoes, and faults.

The GRI is one of 12 inventories funded by the National Park Service (NPS) Inventory and Monitoring Program. The Geologic Resources Division of the NPS Natural Resource Stewardship and Science Directorate administers the GRI. The NPS Geologic Resources Division partners with the Colorado State University Department of Geosciences to produce GRI products. Many additional partners participate in the GRI process by contributing source maps or reviewing products.

The GRI team undertakes three tasks for each park in the Inventory and Monitoring program: (1) conduct a scoping meeting and provide a summary document, (2) provide digital geologic map data in a geographic information system (GIS) format, and (3) provide a GRI report. These products are designed and written for nongeoscientists.

Products

Scoping Meetings: These park-specific meetings bring together local geologic experts and park staff to inventory and review available geologic data and discuss geologic resource management issues. A summary document is prepared for each meeting that identifies a plan to provide digital map data for the park.

Digital Geologic Maps: Digital geologic maps reproduce all aspects of traditional paper maps, including notes, legend, and cross sections. Bedrock, surficial, and special purpose maps such as coastal or geologic hazard maps may be used by the GRI to create digital Geographic Information Systems (GIS) data and meet park needs. These digital GIS data allow geologic information to be easily viewed and analyzed in conjunction with a wide range of other resource management information data.

For detailed information regarding GIS parameters such as data attribute field definitions, attribute field codes, value definitions, and rules that govern relationships found in the data, refer to the NPS Geology-GIS Data Model document available at: <https://www.nps.gov/articles/gri-geodatabase-model.htm>

Geologic Reports: GRI reports synthesize discussions from the original scoping meeting, follow up conference call(s), and subsequent research. Chapters of each report discuss the geologic setting of the park, distinctive geologic features and processes within the park, highlight geologic issues facing resource managers, and describe the geologic history leading to the present-day landscape. Each report also includes a poster illustrating these GRI digital geologic-GIS data.

For a complete listing of GRI products visit the GRI publications webpage: <https://go.nps.gov/gripubs>. GRI digital geologic-GIS data is also available online at the NPS Data Store: <https://irma.nps.gov/DataStore/Search/Quick>. To find GRI data for a specific park or parks select the appropriate park(s), enter "GRI" as a Search Text term, and then select the Search button.

For more information about the Geologic Resources Inventory Program visit the GRI webpage: <https://www.nps.gov/subjects/geology/gri.htm>. At the bottom of that webpage is a "Contact Us" link if you

need additional information. You may also directly contact the program coordinator:

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The Geologic Resources Inventory (GRI) program is funded by the National Park Service (NPS) Inventory and Monitoring (I&M) Division. Learn more about I&M and the 12 baseline inventories at the I&M webpage: <https://www.nps.gov/im/inventories.htm>.

GRI Digital Map and Source Map Citation

The GRI digital geologic-GIS map for American Memorial Park, Saipan, Commonwealth of Northern Mariana Islands (AMME).

Digital Geologic-GIS Map of American Memorial Park and Vicinity, Saipan, Commonwealth of Northern Mariana Islands (*GRI MapCode AMME*)

The map was produced using the following source map and GIS data. The full extent of the source map was used and all geologic features were captured.

Weary, D.J., and Burton, W.C., 2011, Preliminary Geologic Map of the Island of Saipan, Commonwealth of the Northern Mariana Islands: U.S. Geological Survey, Open-File Report OF-2011-1234, scale 1:25,000 ([Island of Saipan](#)). (*GRI Source Map ID 75591*).

Additional information pertaining to each source map is also presented in the GRI Source Map Information (AMMEMAP) table included with the GRI digital geologic-GIS data.

Index Map

The following index map displays the boundary for American Memorial Park (as of January, 2022) in green. The GRI digital geologic-GIS data for the park is the extent of the Island of Saipan and the nearby smaller island (but not the Island of Tinian).



Index map by Kajsa Holland-Goon and Stephanie O'Meara (Colorado State University)

Map Unit List

The geologic units present in the digital geologic-GIS data produced for American Memorial Park, Saipan, Commonwealth of Northern Mariana Islands (AMME) are listed below. Units are listed with their assigned unit symbol and unit name (e.g., Qaf - Artificial fill). Units are listed from youngest to oldest. No description for water is provided. Information about each geologic unit is also presented in the GRI Geologic Unit Information (AMMEUNIT) table included with the GRI digital geologic-GIS data.

Cenozoic Era

Quaternary Period

Holocene Epoch

- [Qaf](#) - Artificial fill
- [Qrb](#) - Beach deposits
- [Qgs](#) - Gravel and sand in emerged moats
- [Qm](#) - Marsh deposits
- [Qrl](#) - Emerged carbonate sands

Holocene and Pleistocene Epochs

- [Qa](#) - Alluvium, clay and gravel
- [Qc](#) - Alluvium, clay wash
- [Qst](#) - Shoreline talus deposits
- [Ql](#) - Landslide deposits
- [Qx](#) - Offset residual and slumped limestone blocks
- [Qtd](#) - Younger terrace deposits
- [Qmc](#) - Residual clay derived from the Mariana Limestone

Quaternary and Tertiary Periods

Pliocene? to Holocene

- [QTtvc](#) - Residual clay derived from the Tagpochau Limestone

Quaternary Period

Pleistocene Epoch

- [Qta](#) - Tanapag Limestone
- [Qp](#) - Terrace deposits younger than Mariana Limestone

Quaternary and Tertiary Periods

Pleistocene and Pliocene Epochs

- [Mariana Limestone](#)
- [QTmh](#) - Mariana Limestone, Halimeda-rich facies
- [QTmm](#) - Mariana Limestone, massive facies
- [QTmmp](#) - Mariana Limestone, massive facies - pink variant
- [QTma](#) - Mariana Limestone, Acropora-rich facies
- [QTmr](#) - Mariana Limestone, rubbly facies

Tertiary Period

Pliocene? Epoch

Older Terrace Deposits

[Tto2](#) - Older terrace deposits, between 152 and 177 m elevation

[Tto1](#) - Older terrace deposits, between 171 and 216 m elevation

Pliocene? and Miocene Epochs

[Donni formation](#)

[Tdos](#) - Donni formation, sandstone member

[Tdot](#) - Donni formation, transitional member

[Tdoc](#) - Donni formation, conglomerate member

Miocene Epoch

Fina-sisu Formation

[Tf](#) - Fina-sisu Formation, andesitic marine tuffs

[Tff](#) - Fina-sisu Formation, basalt flow

[Tagpochau Limestone](#)

[Ttu](#) - Tagpochau Limestone, undivided

[Ttl](#) - Tagpochau Limestone, limestone member

[Ttm](#) - Tagpochau Limestone, marly facies

[Ttv](#) - Tagpochau Limestone, tuffaceous facies

Eocene? Epoch

[Matansa Limestone](#)

[Tmw](#) - Matansa Limestone, white facies

[Tmp](#) - Matansa Limestone, pink facies

[Tmt](#) - Matansa Limestone, basal transitional facies

[Densinyama Formation](#)

[Tdm](#) - Densinyama Formation, limestone and conglomerate facies

[Tdc](#) - Densinyama Formation, conglomerate and sandstone facies

[Tdcq](#) - Densinyama Formation, quartzose conglomerate and sandstone facies

[Tdb](#) - Densinyama Formation, breccia facies

Eocene Epoch

[Hagman Formation](#)

[Thu](#) - Hagman Formation, undivided

[Thc](#) - Hagman Formation, conglomerate and sandstone

[Thf](#) - Hagman Formation, andesite lava flow

[Sankakuyama Formation](#)

[Tsu](#) - Sankakuyama Formation, undivided

[Tst](#) - Sankakuyama Formation, tuff

[Tsf](#) - Sankakuyama Formation, rhyolite lava flow and breccia

Map Unit Descriptions

Descriptions of all geologic map units are presented below. All descriptions taken from source map [Island of Saipan](#).

Qaf - Artificial fill (Holocene)

Chiefly limestone rubble and sandy material. Principally located in central-western coastal plain. Mapped only where extensive or where geologic map-unit contacts are obscured.

Qrb - Beach deposits (Holocene)

Sand, gravel, beach rock, and patches of recently emerged coralline and algal limestone.

Qgs - Gravel and sand in emerged moats (Holocene)

Calcareous shell-and-coral gravel and carbonate sand, apparently washed up by recent storms and forming a veneer on emerged reef moats in the top surface of either the [Tanapag Limestone \(Qta\)](#) or [Mariana Limestone](#). Restricted to the northeastern part of the island and elevations less than 12 m.

Qm - Marsh deposits (Holocene)

Soft, sticky, bluish-gray to grayish-brown clay. Observed in depressions adjacent to the western coastal plain.

Qrl - Emerged carbonate sands (Holocene)

Very fine to very coarse grained, locally gravelly, carbonate sand. Contains abundant mollusk shells and foraminifera. Emerged to as much as 6 m above sea level, chiefly on western coastal plain.

Qa - Alluvium, clay and gravel (Holocene and Pleistocene)

Deposited by streams that drain valleys.

Qc - Alluvium, clay wash (Holocene and Pleistocene)

Reworked residual clay, characteristically containing ferruginous and manganiferous pellets, deposited in closed depressions and over broad outwash areas.

Qst - Shoreline talus deposits (Holocene and Pleistocene)

Talus consisting of limestone blocks or blocks of both limestone and volcanic rocks deposited along steep areas of the eastern coastline.

Ql - Landslide deposits (Holocene and Pleistocene)

Mixture of large and small blocks of [Donni formation](#) (informal name) sandstone and the [Tagpochau \(Ttl\)](#) and [Mariana \(QTmh\)](#) Limestones. Mapped only in one area near Puntan Hakmang.

Qx - Offset residual and slumped limestone blocks (Holocene and Pleistocene)

Mostly large (up to 18 m across) blocks derived from massive beds of both the [Mariana Limestone \(QTmh\)](#) and the [Tagpochau Limestone \(Ttl\)](#). This deposit has resulted from slow downhill creep (with little rotation) of these blocks over a surface underlain by the [Hagman Formation \(Thc\)](#). Conglomerate and sandstone of the Hagman Formation is locally exposed between blocks. Mapped only in one area near Puntan Hakmang.

Qtd - Younger terrace deposits (Holocene and Pleistocene)

Tuffaceous sands and gravels of lowest terrace above emerged carbonate sands ([Qrl](#)). Mapped only in one area near the central part of the northwestern coast.

Qmc - Residual clay derived from the Mariana Limestone (Holocene and Pleistocene?)

Mottled yellowish- to dark-brown and gray clay. Developed over rubbly ([QTmr](#)) and massive ([QTmm](#)) facies of the Mariana Limestone. Maximum thickness about 12 m.

QTtvc - Residual clay derived from the Tagpochau Limestone (Pliocene? to Holocene)

Mottled and banded clay, either light gray and white or reddish brown and yellowish brown. Developed over the [Tagpochau Limestone](#) (either the marly or the tuffaceous facies). Maximum thickness at least 12 m.

Qta - Tanapag Limestone (Pleistocene)

Dirty-white to brown emergent fringing coral reef limestone (bafflestone to framestone) occurring below 30 m elevation. Contains abundant, well-preserved fossil corals and coralline algae. Maximum thickness about 15 m.

Qp - Terrace deposits younger than Mariana Limestone (Pleistocene)

Iron-stained, locally quartz-rich, reworked tuffaceous sands and minor gravels at elevations between 30 and 171 m. Clastic material is derived from erosion of older volcanic units. Maximum thickness 3m.

Mariana Limestone

Limestone, commonly coralline and algal, partly argillaceous. Maximum inferred thickness more than 152 m.

QTmh - Mariana Limestone, Halimeda-rich facies (Pleistocene and Pliocene)

Dirty-white and brown massive to bedded, bioclastic limestone (packstone to grainstone) rich in *Halimeda* joints and impressions. Mapped to the east of massive facies ([QTmm](#)) and intergrades with it over a large area.

QTmm - Mariana Limestone, massive facies (Pleistocene and Pliocene)

Dirty-white or pink, generally massive and cavernous, bioclastic limestone. Coral- and algae-rich reef and rubble limestone (floatstone, bafflestone, and rudstone) common in southern Saipan.

QTmmp - Mariana Limestone, massive facies - pink variant (Pleistocene and Pliocene)

Dull-pink algae-rich limestone ([QTmmp](#)) locally mapped within [QTmm](#). Deep weathering of this facies resulted in development of clay deposits ([Qmc](#)).

QTma - Mariana Limestone, Acropora-rich facies (Pleistocene and Pliocene)

Argillaceous limestone (floatstone to bafflestone) rich in *Acropora*, most of which is fragmented but some of which is intact and in life position. Commonly weathers to thick residual clay. Contact with massive facies ([QTmm](#)) is gradational (generalized on map).

QTmr - Mariana Limestone, rubbly facies (Pleistocene and Pliocene)

Highly argillaceous limestone (floatstone); includes large amounts of broken and displaced coral.

Older Terrace Deposits (Pliocene?)

Tto2 - Older terrace deposits, between 152 and 177 m elevation (Pliocene?)

Reworked argillaceous, locally quartz-rich sand and gravel. Tto2 includes lowest and youngest deposits, between 152 and 177 m elevation.

Tto1 - Older terrace deposits, between 171 and 216 m elevation (Pliocene?)

Reworked argillaceous, locally quartz-rich sand and gravel. Tto1 includes highest and oldest deposits, between 171 and 216 m elevation.

Donni formation (Pliocene? and Miocene)

Calcareous and tuffaceous marine sandstone, conglomerate, and tuffaceous limestone. Total inferred thickness about 58 m. Formation name is informal.

Tdos - Donni formation, sandstone member (Pliocene? and Miocene)

Light- and dark-brown or yellowish- to olive-gray, thin-to medium-bedded, tuffaceous, calcareous sandstone, siltstone, marl, shale, and pebble-and-granule conglomerates. Commonly rich in smaller foraminifera, particularly globigerinids. Overlies informally named Machegit conglomerate member and the transitional facies. Maximum thickness 58 m (Cloud and others, 1956).

Tdot - Donni formation, transitional member (Pliocene? and Miocene)

Calcareous conglomerate and tuffaceous limestone and sandstone, commonly with abundant larger foraminifera (possibly reworked from the [Tagpochau Limestone](#)). Sediments transition upward or laterally into the sandstone member. Maximum thickness in outcrop of about 12 m.

Tdoc - Donni formation, conglomerate member (Pliocene? and Miocene)

Boulder and cobble conglomerate of reworked volcanic materials. Resembles conglomerates of Densinyama Formation. Locally contains decalcified blocks derived from the [Tagpochau Limestone](#). Possibly a nonmarine deposit. Maximum thickness of at least 12 m.

Fina-sisu Formation (Miocene)**Tf - Fina-sisu Formation, andesitic marine tuffs (Miocene)**

Interlayered andesitic marine tuffs and basalt flow rocks. Tuffs locally rich in planktonic foraminifera. Maximum thickness at least 122 m.

Tff - Fina-sisu Formation, basalt flow (Miocene)

Separately mapped basalt flow.

Tagpochau Limestone (Miocene)

White to pink, locally variegated, massive to bedded, locally fossiliferous limestone. Locally rich in clasts of volcanic rocks or fine-grained argillaceous material derived from erosion of older formations. Most common unit exposed in the higher cliffs and uplands of central Saipan. Deep weathering over marly and tuffaceous facies resulted in development of clay deposits ([QTvc](#)). Maximum inferred thickness about 305 m.

Ttu - Tagpochau Limestone, undivided (Miocene)

Shown in cross sections only ([Geologic Cross Sections](#)).

Ttl - Tagpochau Limestone, limestone member (Miocene)

Massive to well-bedded, relatively pure, sparsely to abundantly foraminiferal limestone (mudstone to grainstone).

Ttm - Tagpochau Limestone, marly facies (Miocene)

Massive to well-bedded, argillaceous limestone.

Ttv - Tagpochau Limestone, tuffaceous facies (Miocene)

Massive to well-bedded, impure limestone containing argillaceous material and clasts of volcanic rock.

Matansa Limestone (Eocene?)

Pure to earthy, well-indurated, inequigranular, clastic foraminifera-bearing limestone. Inferred aggregated thickness about 152 m.

Tmw - Matansa Limestone, white facies (Eocene?)

White, massive- to well-bedded, relatively pure, sparsely foraminiferal limestone (mudstone to wackestone). Locally may be black, gray, pink, or reddish-brown owing to presence of manganese oxide or magnetite particles. Cements are typically equigranular.

Tmp - Matansa Limestone, pink facies (Eocene?)

Pink, massive to locally well-bedded, foraminiferal limestone (wackestone to packstone). Cements are typically inequigranular.

Tmt - Matansa Limestone, basal transitional facies (Eocene?)

Tuffaceous limestone and calcareous conglomerate. Noncarbonate clasts include andesite particles, siliceous rock fragments, quartz and feldspar grains, and clay minerals. Vertically transitional from underlying Densinyama Formation.

Densinyama Formation (Eocene?)

Andesitic breccias and conglomerate, tuffaceous sandstone, tuffaceous limestone, and calcareous conglomerate. Maximum inferred thickness about 244 m.

Tdm - Densinyama Formation, limestone and conglomerate facies (Eocene?)

Thick- to thin- bedded, coarse-grained impure limestone and calcareous conglomerate. Mapped as lens-shaped bodies and irregular beds within upper part of the conglomerate and sandstone facies ([Tdc](#)). Contains many quartz grains and small pebbles, granules, and grains of andesite, chert, and silicified pyritic rocks. Lithically and faunally similar to overlying basal transitional facies ([Tmt](#)) of Matansa Formation.

Tdc - Densinyama Formation, conglomerate and sandstone facies (Eocene?)

Thick-bedded, largely or wholly marine conglomerate and tuffaceous sandstone deposited as discontinuous, intertonguing bodies. Conglomerate consists of subangular to well-rounded fragments of andesite, dacite, chert, and silicified pyritic rocks. Little or no free quartz grains visible.

Tdcq - Densinyama Formation, quartzose conglomerate and sandstone facies (Eocene?)

Thick-bedded, largely or wholly marine conglomerate and tuffaceous sandstone deposited as discontinuous, intertonguing bodies. Free quartz grains common. Conglomerate consists of subangular to well-rounded fragments of andesite, dacite, chert, and silicified pyritic rocks. Bare soils in areas underlain by the this unit sparkle in sunlight due to abundant quartz.

Tdb - Densinyama Formation, breccia facies (Eocene?)

Massive, heterogeneous breccia consisting of coarse, angular to rounded rock fragments. Clasts are dominantly andesitic but also contain abundant siliceous rocks. Clasts range up to 1.2 m in diameter. Basal facies of Densinyama Formation.

Hagman Formation (Eocene)

Andesite lava flows and andesitic volcaniclastic sedimentary rocks. Maximum exposed thickness about 335 m.

Thu - Hagman Formation, undivided (Eocene)

Shown in cross sections only ([Geologic Cross Sections](#)).

Thc - Hagman Formation, conglomerate and sandstone (Eocene)

Massive to irregularly bedded (beds up to 3 m thick), poorly sorted, volcaniclastic conglomerates consisting of subangular to rounded pebbles, cobbles, and boulders of porphyritic andesite in sandy to silty matrix. Interlayered with beds (up to 1 m thick) of moderately to well-sorted, locally crossbedded, volcaniclastic sandstone. Probably represents volcaniclastic debris flows and other related sedimentary deposits. Deposits exposed at tip of Kagman Peninsula are finer grained and appear more distal than deposits to the north and west.

Thf - Hagman Formation, andesite lava flow (Eocene)

Dark-gray, buff-weathering, porphyritic andesite lava flows. Typically about 3 m thick. Interfingers with conglomerates ([Thc](#)), except on Kagman Peninsula, where flows are absent.

Sankakuyama Formation (Eocene)

Rhyolite flows, flow breccias, and ash-flow tuffs. Thickness at least 500 m. $^{40}\text{Ar}/^{39}\text{Ar}$ age of 45.1 ± 0.3 Ma (Reagan and others, 2008).

Tsu - Sankakuyama Formation, undivided (Eocene)

Shown in cross sections only ([Geologic Cross Sections](#)).

Tst - Sankakuyama Formation, tuff (Eocene)

White to buff-weathering, fine-grained, irregularly bedded rhyolite ash-flow tuff. In island interior, layers are up to 9 m thick and are intercalated with flows and breccias. In cliffs under Bird Island overlook, up to 30 m thick and laterally interfingers with rhyolite flows and breccia ([Tsf](#)); on Bird Island, grades upward into massive, white matrix-supported breccia with angular gray clasts up to 0.5 m in diameter.

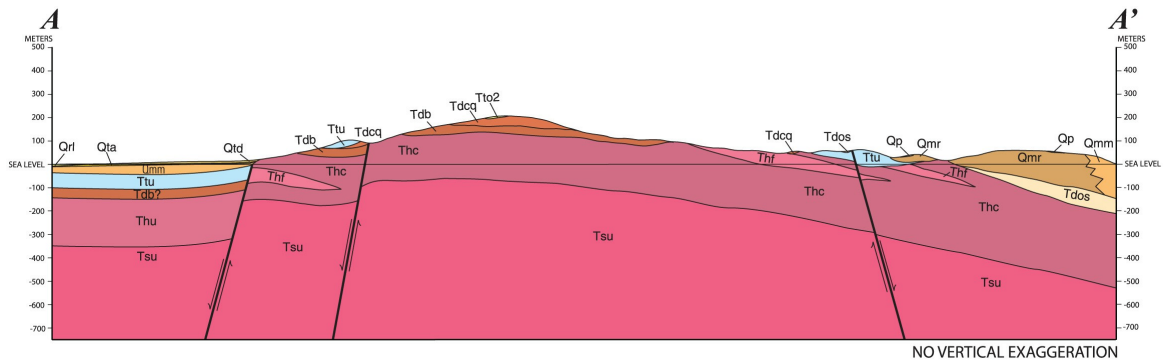
Tsf - Sankakuyama Formation, rhyolite lava flow and breccia (Eocene)

Gray to white to locally reddish, fine-grained rhyolite flow rock. On outcrop scale, interfingers with massive to locally flow-banded, autoclastic breccia consisting of welded, angular rhyolite clasts. Phenocrysts of quartz and plagioclase up to 2 mm length locally common in both flows and breccias.

Geologic Cross Section

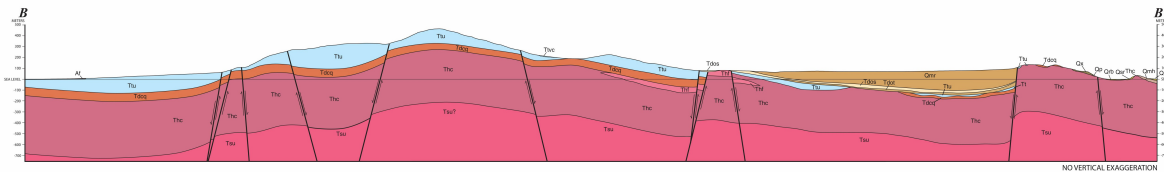
The geologic cross sections present in the GRI digital geologic-GIS data produced for American Memorial Park, Saipan, Commonwealth of Northern Mariana Islands (AMME) are presented below. Cross section graphics were scanned at a high resolution and can be viewed in more detail by zooming in (if viewing the digital format of this document).

Cross Section A-A'



Graphic from source map: [Island of Saipan](#)

Cross Section B-B'



Graphic from source map: [Island of Saipan](#)

Ancillary Source Map Information

The following sections present ancillary source map information associated with the source used for this project.

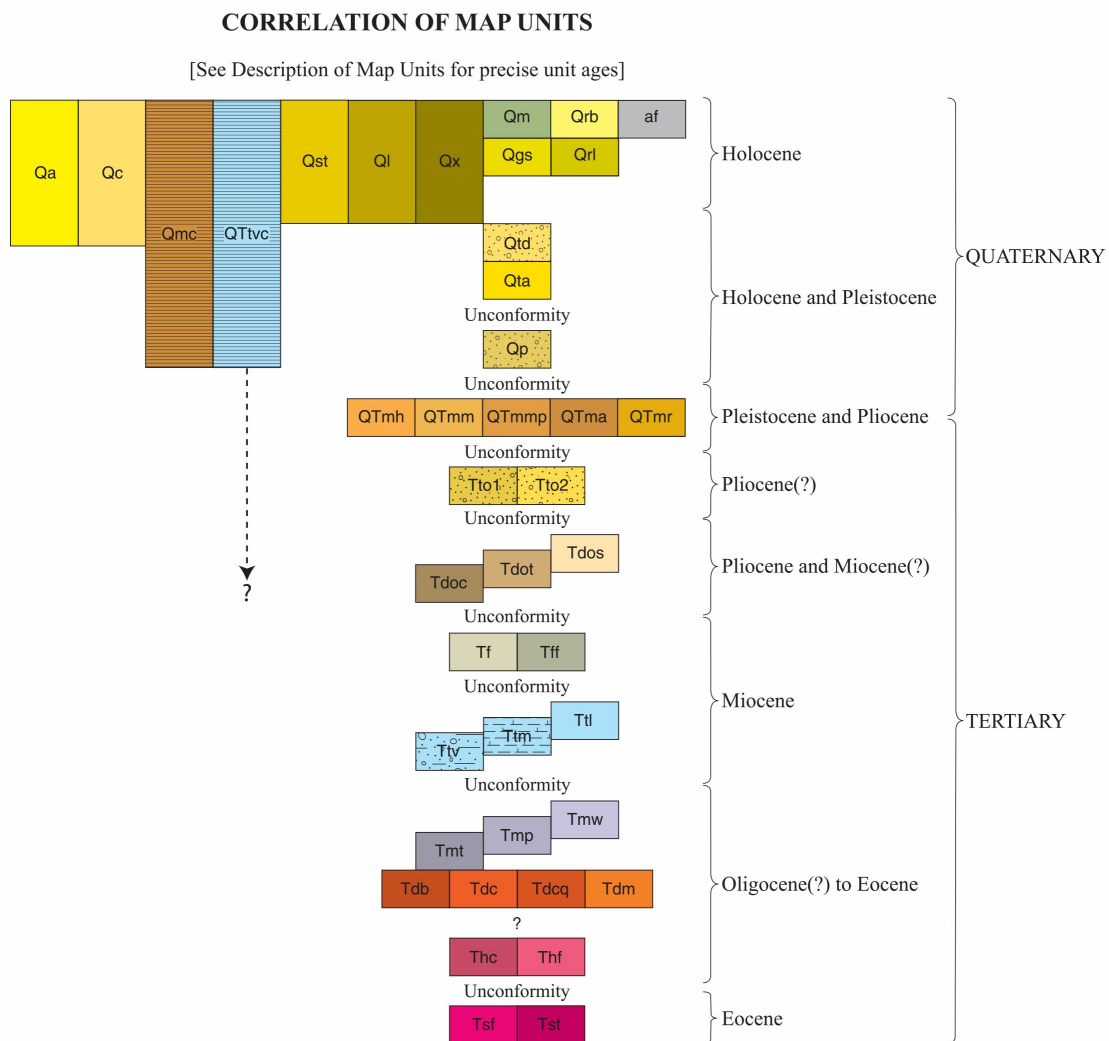
Island of Saipan

The formal citation for this source.

Weary, D.J., and Burton, W.C., 2011, Preliminary Geologic Map of the Island of Saipan, Commonwealth of the Northern Mariana Islands: U.S. Geological Survey, Open-File Report OF-2011-1234, scale 1:25,000 (*GRI Source Map ID 75591*).

Prominent graphics and text associated with this source.

Correlation of Map Units



Graphic from source map: [Island of Saipan](#)

Legend

EXPLANATION OF MAP SYMBOLS

———— **Contact**—Approximately located

———^U/_D **Faults**—Solid where location is accurate; dashed where location is approximate; short dashed where inferred; dotted where location is concealed. U (up) or D (down) indicate relative motion

PLANAR POINT FEATURES

[May be combined with other point features at point of observation]

Strike and dip of bedding

 Inclined

 Horizontal

Strike and dip of joints

 Inclined

 Vertical

OTHER FEATURES



Area of brecciated rock; chiefly found within the Tagpochau Limestone

- S662 **Sample locality referred to in text**

Graphic from source map: [Island of Saipan](#)

Location Map

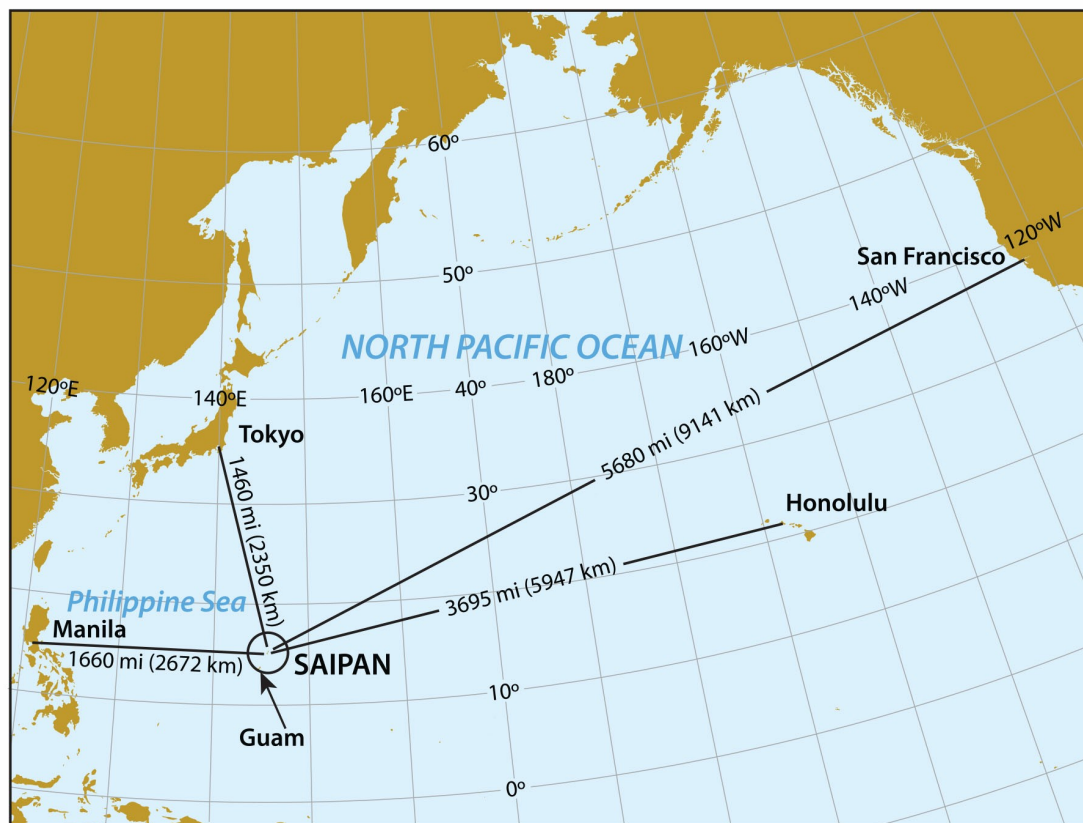


Figure 1. Location of the island of Saipan in the North Pacific Ocean.

Graphic from source map: [Island of Saipan](#)

GRI Digital Data Credits

This document was developed and completed by Stephanie O'Meara (Colorado State University) for the NPS Geologic Resources Division (GRD) Geologic Resources Inventory (GRI) Program. Quality control of this document by James Winter (Colorado State University).

The information in this document was compiled from GRI source map, and is intended to accompany the digital geologic-GIS map and other digital data for American Memorial Park, Saipan, Commonwealth of Northern Mariana Islands (AMME) developed by Greg Mack (NPS Pacific West Region), and Stephanie O'Meara and Jim Chappell (Colorado State University) (see the [GRI Digital Map and Source Map Citation](#) section of this document for all sources used by the GRI in the completion of this document and related GRI digital geologic-GIS map).

GRI finalization by Stephanie O'Meara.

GRI program coordination and scoping provided by Bruce Heise, Jason Kenworthy and Tim Connors (NPS GRD, Lakewood, Colorado).