



Development of a Hydrogeologic Map Series for The Northern Guam Lens Aquifer



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The military expansion and economic growth anticipated for Guam during the coming decade has raised concerns regarding sustainable development and management of the island's groundwater. The most fundamental tool for development and management of groundwater in any aquifer is a set of accurate and precise maps of its hydrologic components. The proposed project would apply the latest technology to provide such maps. Although modest in cost, it is arguably the single most important project for Guam's aquifer at this time, because accurate hydrogeologic maps are the starting point for all other groundwater research and development, including the development and application of numerical models and other tools. WERI researchers and their collaborators have already developed a sophisticated conceptual model of island karst and numerous maps of the karst features that constitute the "plumbing" of Guam's aquifer. This information and the availability of several new GIS techniques and technologies have now made it possible to produce detailed hydrogeologic maps to support ongoing and future research exploration, development, management, and regulation.

This work will involve several steps:

- (1) Assembling existing maps and geographic data, from both paper and digital resources and assuring consistent parameters (*e.g.*, projections, attributes, etc.)
- (2) High-resolution LIDAR mapping of the sinkholes of Guam and field-checking of selected features to verify accuracy and resolution of the LIDAR map.
- (3) High-resolution field mapping of a selected part of the discharge zone of aquifer that builds on previous work and is representative of the basic modes of discharge.

- (4) Overlaying selected feature data sets to produce a set of maps that describe surface conditions, water table and interface geometry, aquifer sub-basins, groundwater zones (basal, para-basal, supra-basal), and water quality (*e.g.*, salinity)
- (5) Producing digital 2-D cross-sections and 3-D graphic images of selected features and combinations of features.

The map should ultimately contain at least the following coverage:

- (1) Updated surficial geology of northern Guam (at 1:24000 scale)
- (2) Updated volcanic basement map of northern Guam
- (3) New LIDAR surface imagery overlay
- (4) Karst features, including maps of sinkholes and caves of northern Guam
- (5) Coastal discharge features: seeps, springs, and flowing fractures and caves
- (6) Generalized mean groundwater elevation map
- (7) Generalized mean freshwater-saltwater interface map
- (8) Selected infrastructure
- (9) Zones of estimated hydraulic conductivity and porosity
- (10) Zones of varying salinity
- (11) Soil map of Guam