Pacific WASH

WEBINARS

Samoa Groundwater Study

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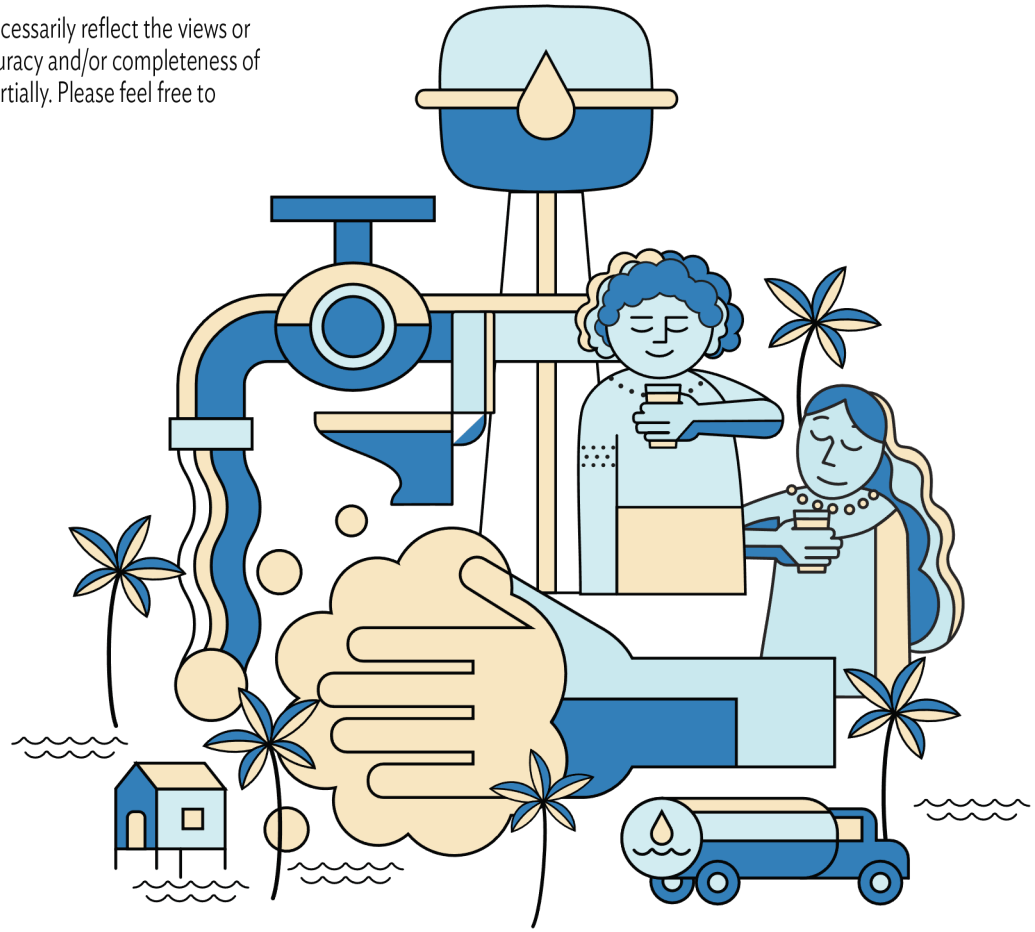


Samoa Groundwater Study

Mainstreaming water resilience through dynamic and adaptive planning

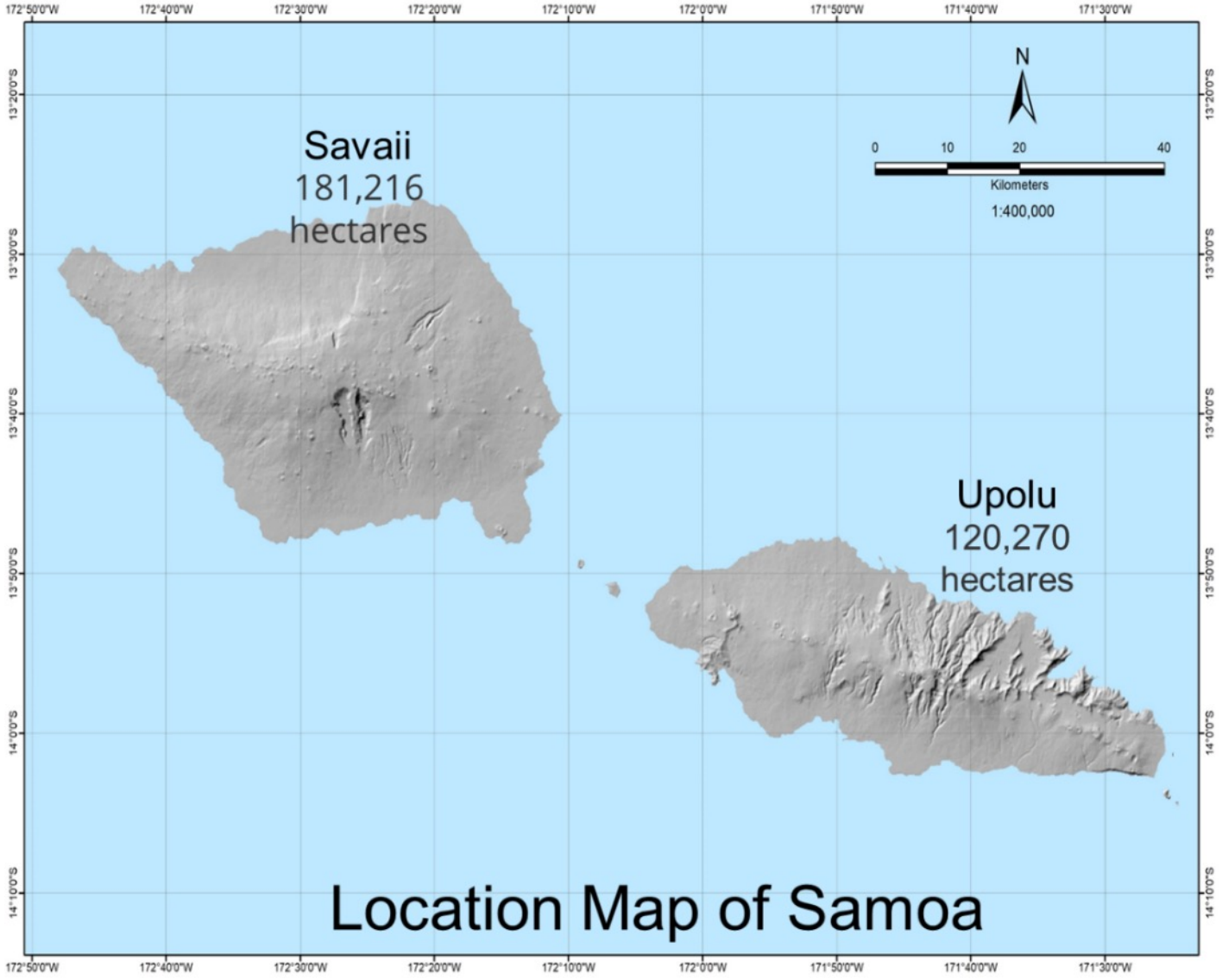
Fuimaono Dominic Schwalger – Managing Director SWA
Sharon Lesa – WWD Engineer
Reynar Rollan – ADB Consultant/Hydrogeologist

Pacific WASH Webinar
17th May 2023

Presentation Outline

1. Samoa Water Situationer
2. Samoa's Approach to Climate Change Impacts on Groundwater Resources
   a. Watershed-based and GIS-aided spatial assessment
   b. Water Balance Analysis
3. Plans for Groundwater Development and Management

Samoa Water Situation



Major Water Providers

- Samoa Water Authority (SWA) – serves 85% of the population
- Independent Water Schemes Association (IWSA)

Water Sources

SWA: Surface water:

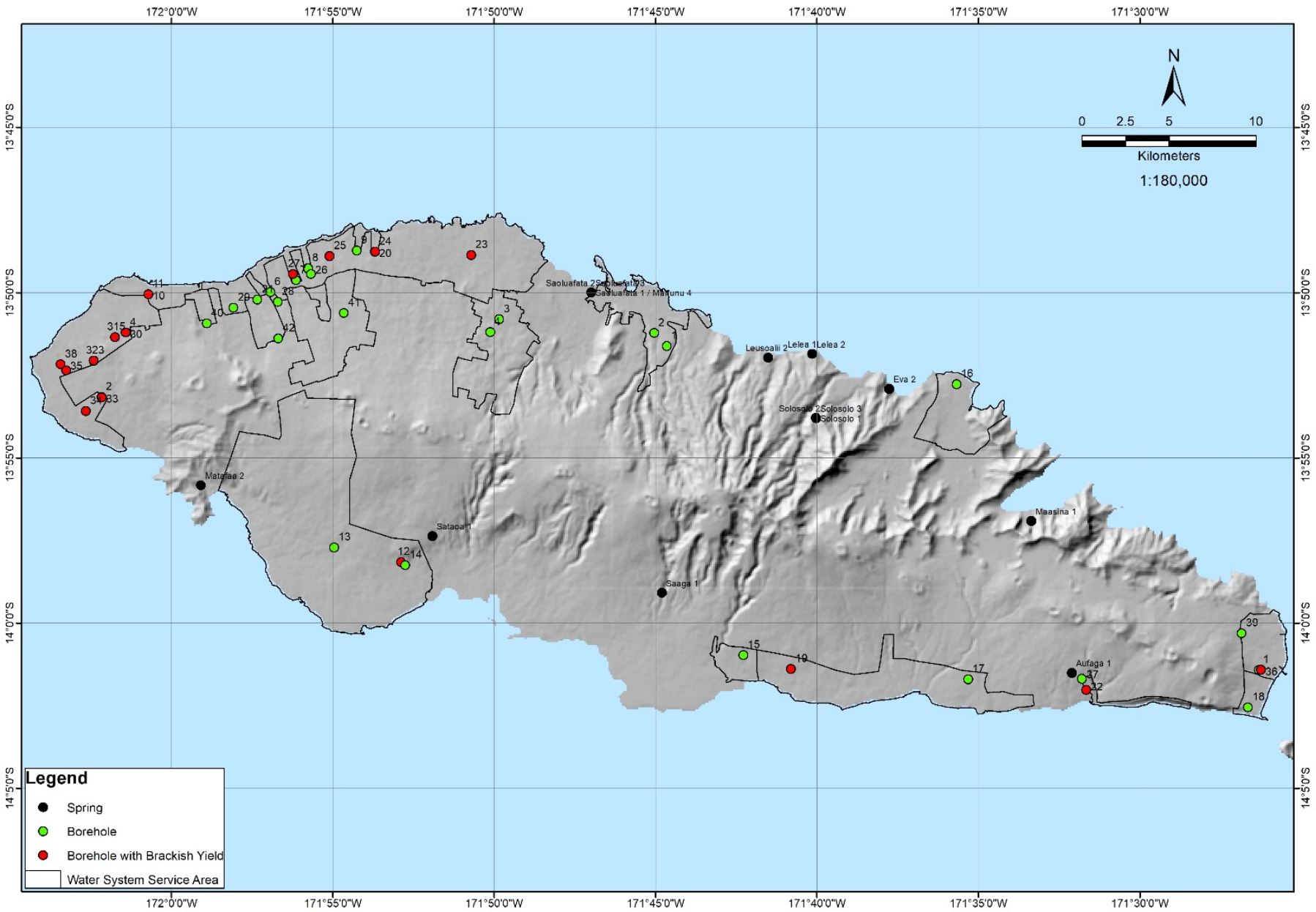
- 19,240,531m³/year (75%)
- 39 wells, 2 springs: 5,80,1639 m³/year (25%)
- IWSA: 18 springs

Cite country-specific (SWA operational) issues:

- Decline in water availability
- Salt water intrusion
- Damage to water infra due to natural disasters

SWA Drilling Works

Well and Spring Sources of Upolu Island

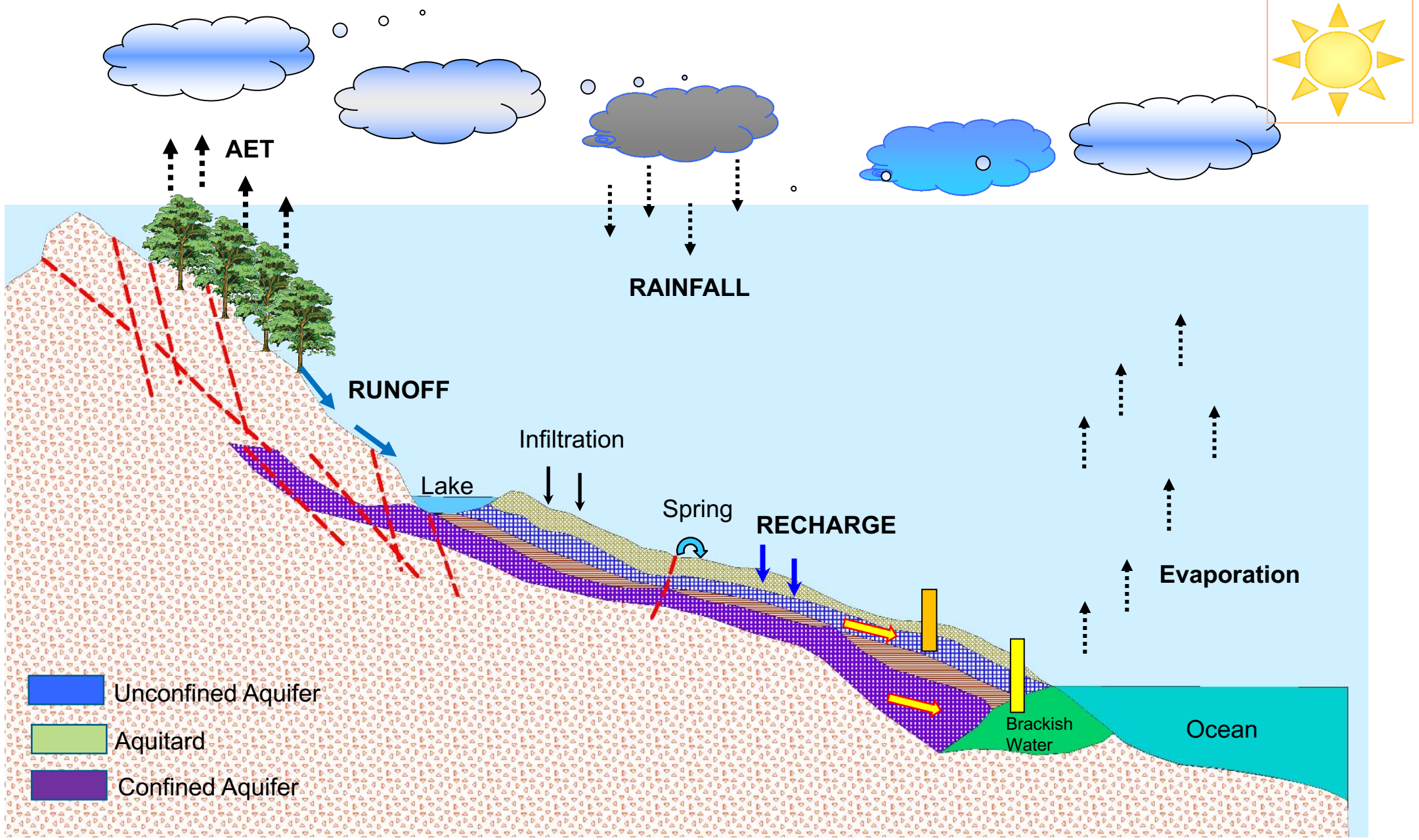


Mainstreaming Climate Resilience in water operations: Holistic Island-wide Groundwater Study

? Location of groundwater sources

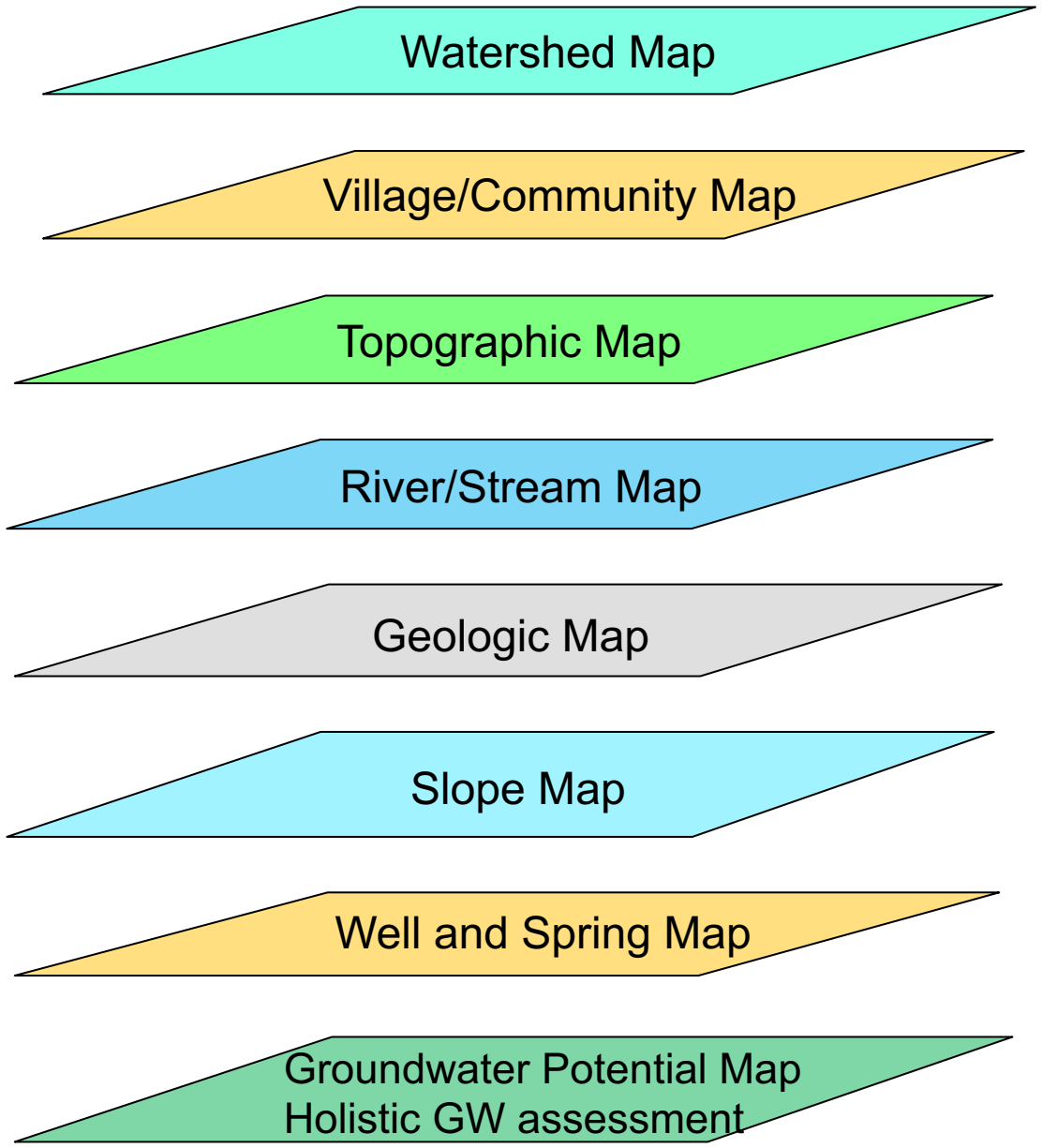
? Availability of groundwater

Watershed approach within the framework of the water cycle



Hydrologic Cycle

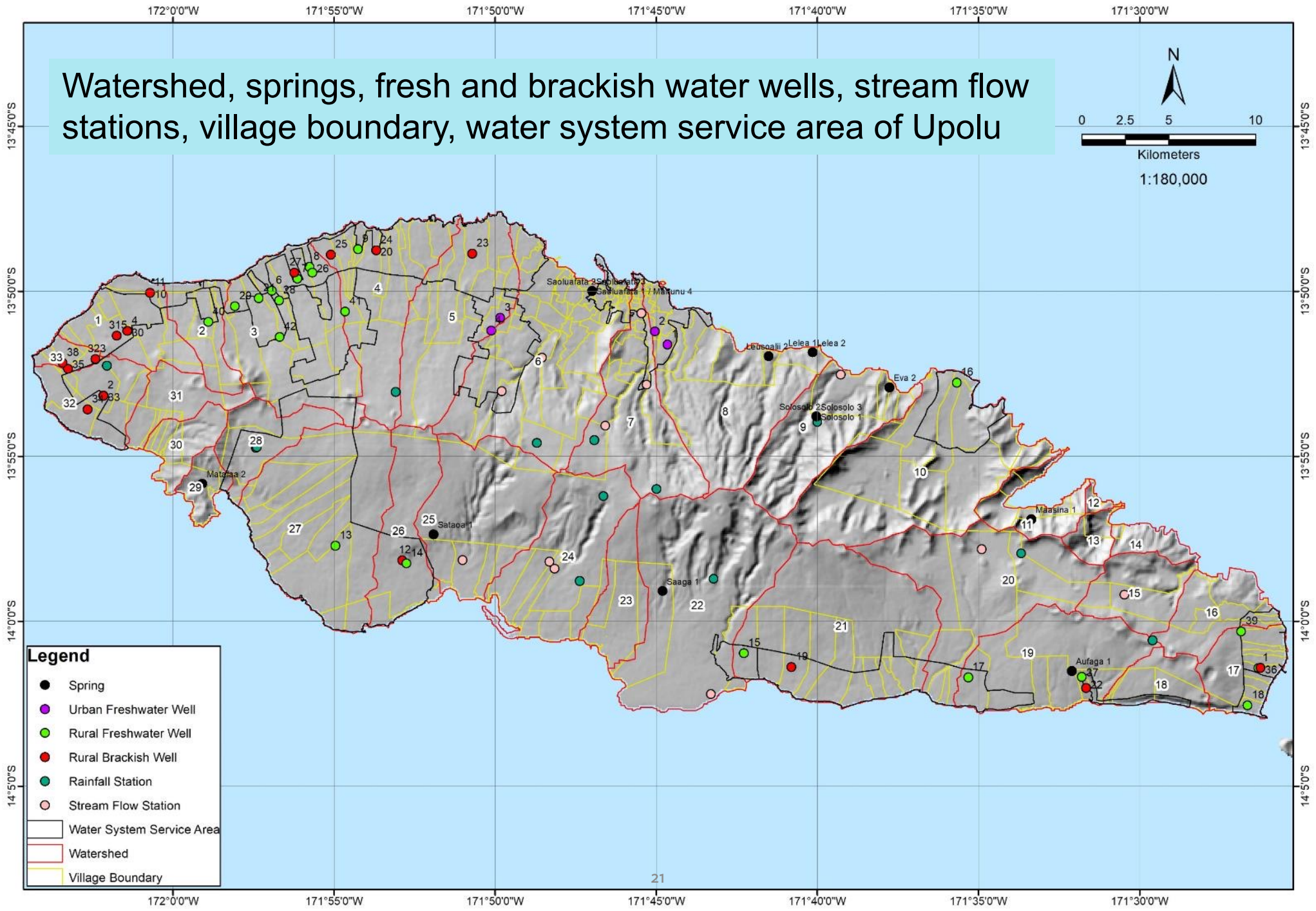
GIS-aided Spatial Analysis



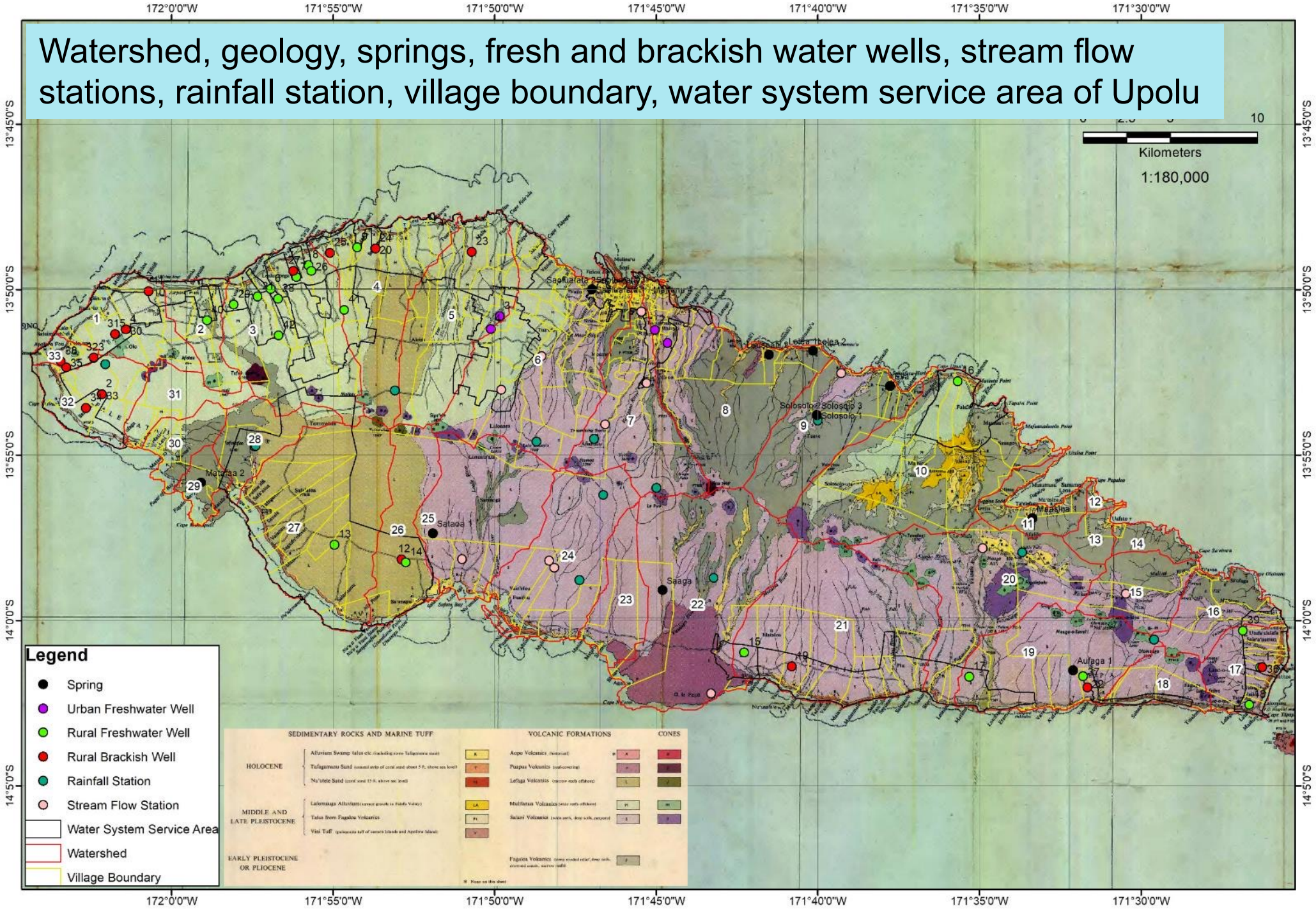
Water Balance Analysis

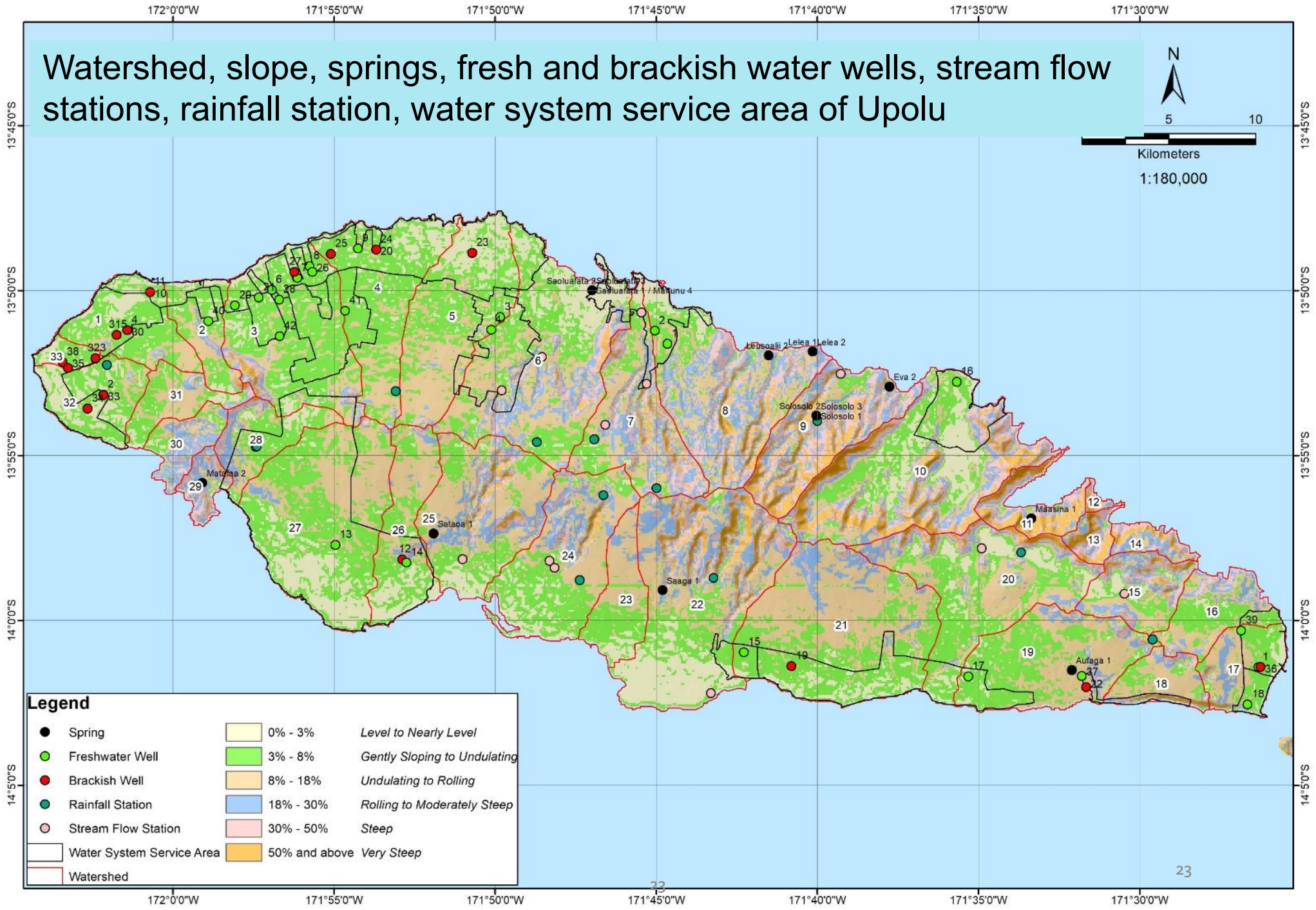
Rainfall
Temperature
Sunshine Hours
Landuse
Soil Map
Geology
Stream Flow

Rainfall = Actual Evapotanspitation + Runoff + **Groundwater Recharge**


Watershed, springs, fresh and brackish water wells, stream flow stations, village boundary, water system service area of Upolu
N
0 2.5 5 10
Kilometers
1:180,000
172°0'0"W
171°55'0"W
171°50'0"W
171°45'0"W
171°40'0"W
171°35'0"W
171°30'0"W
13°45'0"S
13°50'0"S
13°55'0"S
14°0'0"S
14°5'0"S
Saoluafata 1
Saoluafata 2
Saoluafata 3
Saoluafata 4
Leusoalii 2
Lelea 1
Lelea 2
Eva 2
Solosolo 2
Solosolo 3
Solosolo 1
Matatoa 2
Sataoa 1
Saaga 1
Maasina 1
Aufaga 1
Legend
Spring
Urban Freshwater Well
Rural Freshwater Well
Rural Brackish Well
Rainfall Station
Stream Flow Station
Water System Service Area
Watershed
Village Boundary

Watershed, geology, springs, fresh and brackish water wells, stream flow stations, rainfall station, village boundary, water system service area of Upolu




Watershed, slope, springs, fresh and brackish water wells, stream flow stations, rainfall station, water system service area of Upolu
N
5
10
Kilometers
1:180,000
172°0'0"W
171°55'0"W
171°50'0"W
171°45'0"W
171°40'0"W
171°35'0"W
171°30'0"W
13°45'0"S
13°50'0"S
13°55'0"S
14°0'0"S
14°5'0"S
Saoluafata 2
Saoluafata 3
Saoluafata 1 / Makunu 4
Leusoalii 2
Lelea 1
Lelea 2
Eva 2
Solosolo 2
Solosolo 3
Solosolo 1
Matafaa 2
Sataoa 1
Saaga 1
Maasina 1
Aufaga 1
Legend
Spring
Freshwater Well
Brackish Well
Rainfall Station
Stream Flow Station
Water System Service Area
Watershed
0% - 3%
Level to Nearly Level
3% - 8%
Gently Sloping to Undulating
8% - 18%
Undulating to Rolling
18% - 30%
Rolling to Moderately Steep
30% - 50%
Steep
50% and above
Very Steep

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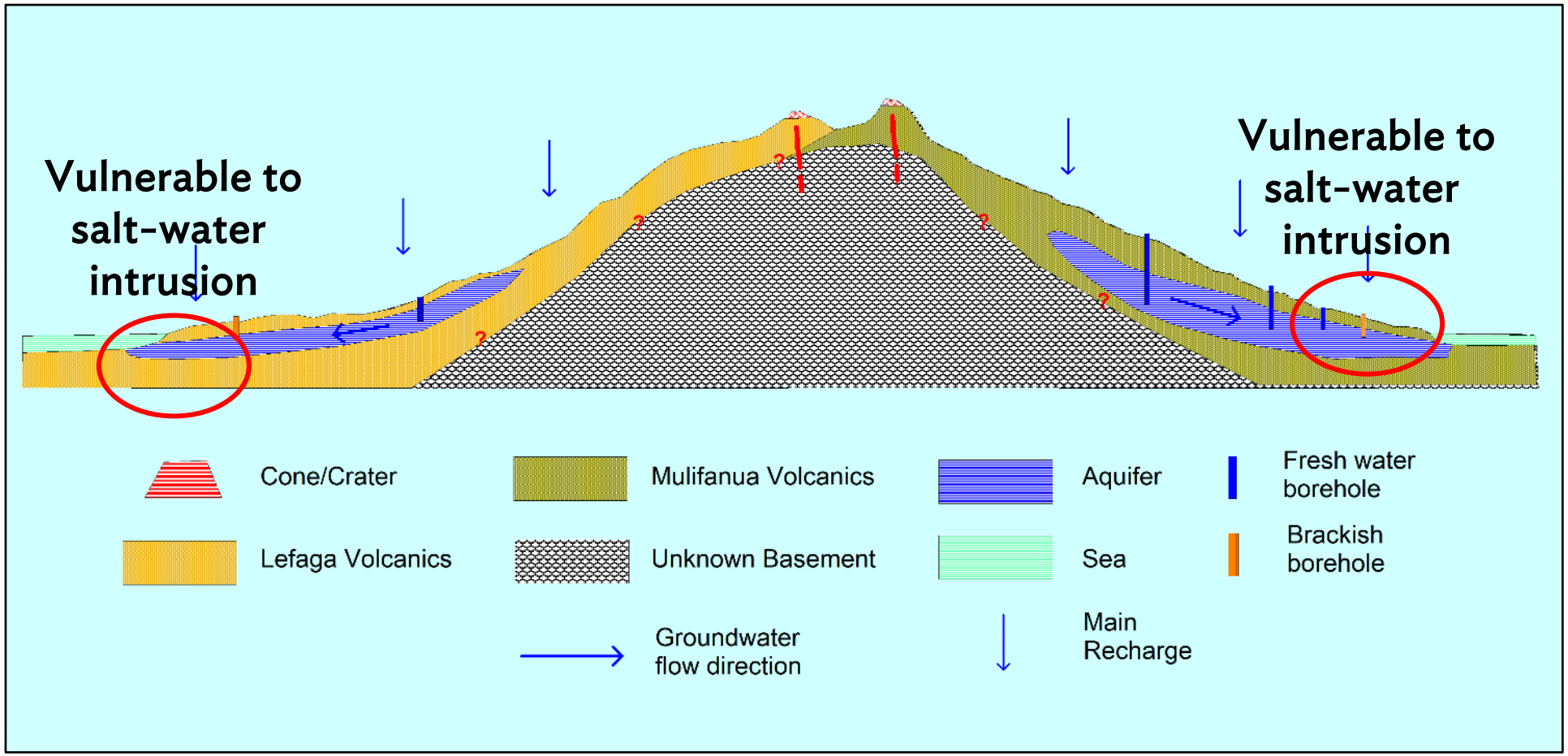
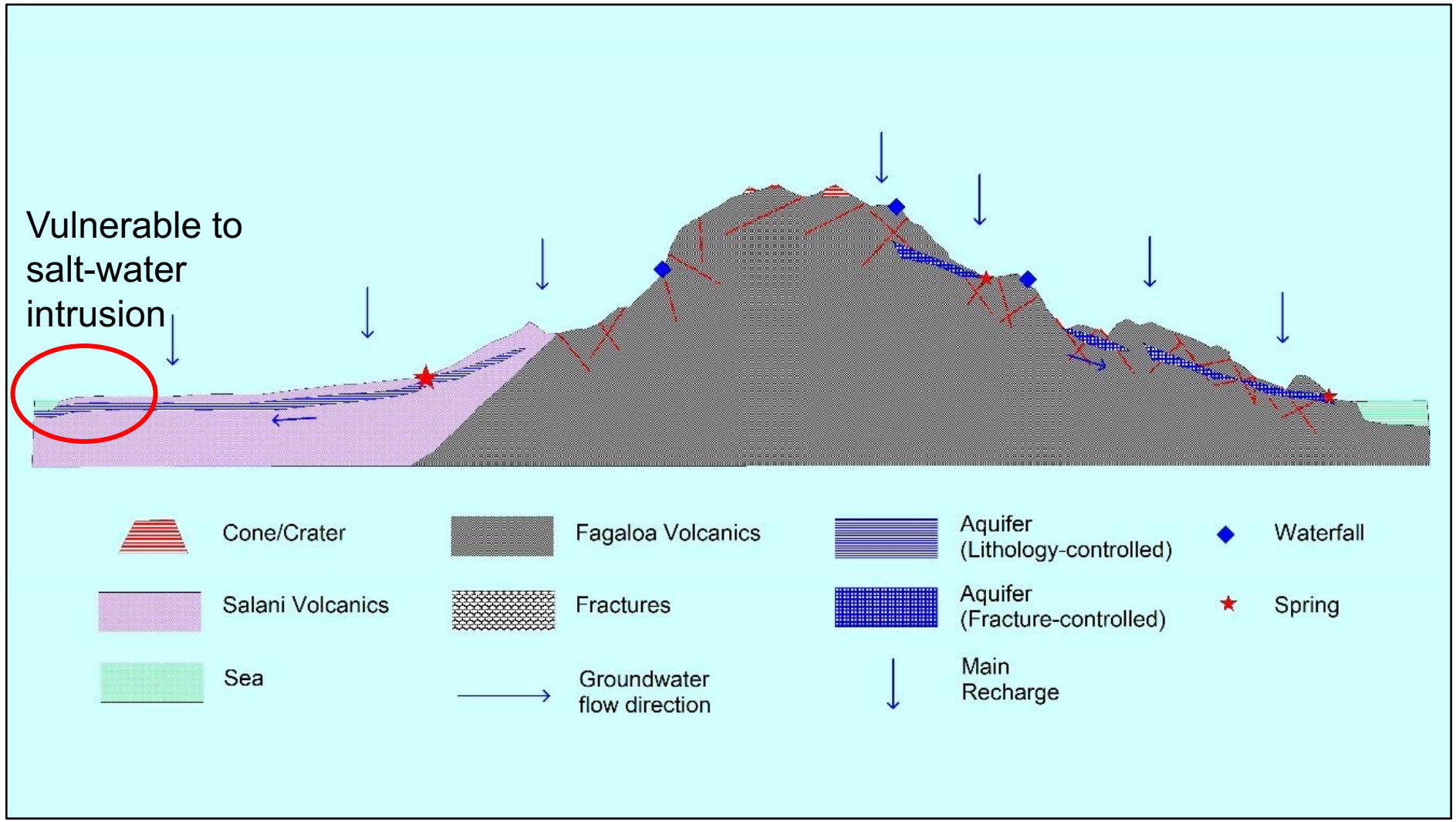
Results of Spatial Analysis:
We know where the water is, its location and occurrence!

1. Upolu has 33 watersheds, Savaii has 35 watersheds
2. Current production wells drilled only through the 3 young volcanic formations
3. Springs occur within the old volcanic formation
4. Springs and wells are located within the slope range of 0 to 8%
5. Surface water sources of Upolu found within the old volcanic formation
6. Most wells drilled through the northwest and eastern sections of the 2 islands where watersheds areas are small
7. Large areas of both island largely unexplored for groundwater
8. Salt-water intrusion has taken place in wells drilled in small watersheds



Lithology-dominated Groundwater System in Northwestern Upolu



Fracture-dominated Groundwater System in Central Upolu

Results of Water Balance Analysis

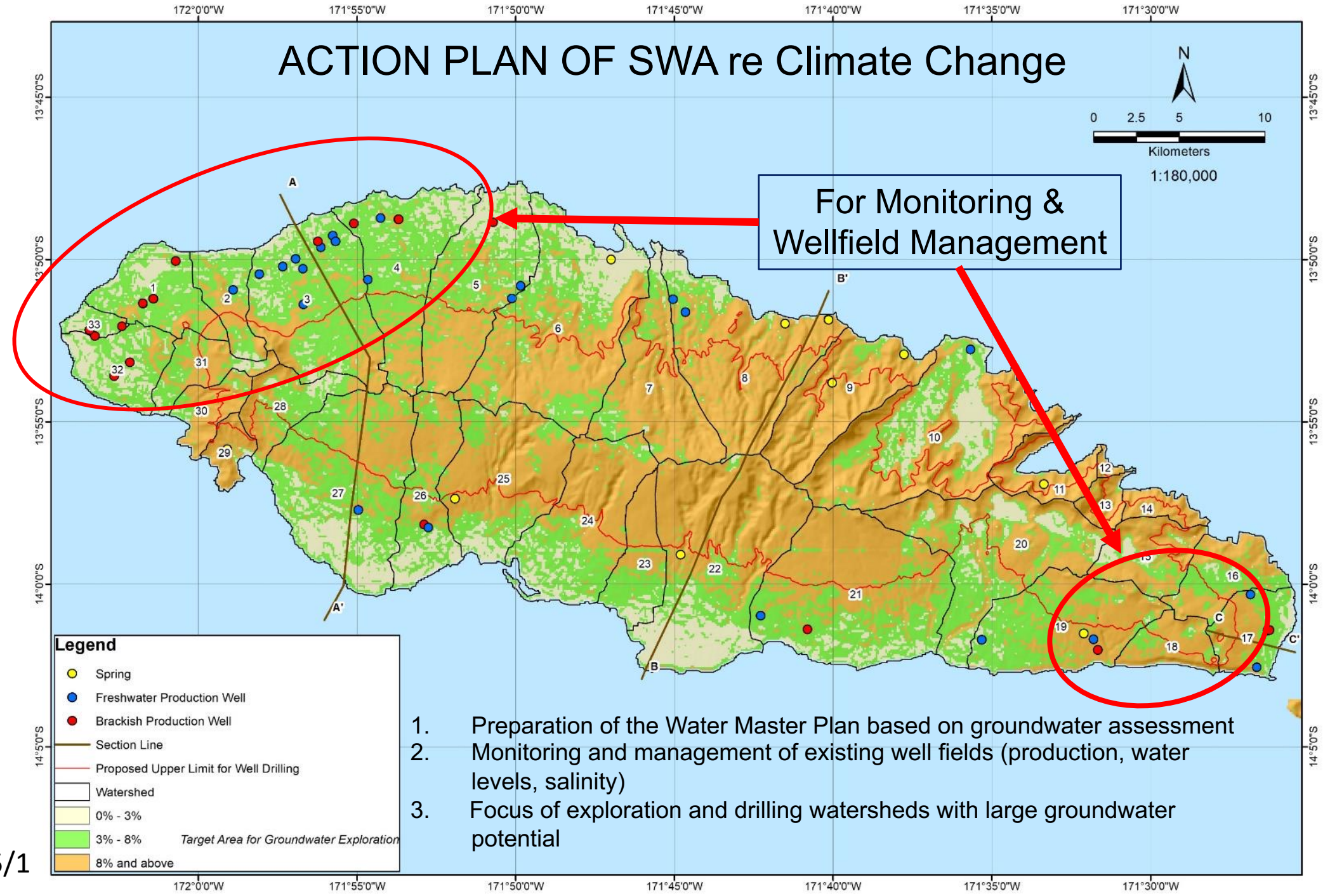
Water Balance Zones	Location	Potential Groundwater (lps)
Upolu Zone 1	Eastern half Upolu	12,382
Upolu Zone 2	NW Upolu	3,105
Upolu Zone 3	Western Upolu	658
Savaii Zone 1	NW Savaii	4,432
Savaii Zone 2	Rest of Savaii	19,908

Zones with large rainfall and watersheds have large groundwater potential: large unexplored and partially tapped

Well fields of SWA located in small to medium watersheds: UZone 3 and SZone 1

Field Validations in Upolu

ACTION PLAN OF SWA re Climate Change



1. Preparation of the Water Master Plan based on groundwater assessment
2. Monitoring and management of existing well fields (production, water levels, salinity)
3. Focus of exploration and drilling watersheds with large groundwater potential

Key messages on climate change and groundwater resources

With proper application of basic hydrogeologic principles, the anticipated impacts of climate change on groundwater resources in Samoa and similar island nations in the Pacific can be mitigated.

Know your resources, their location, distribution and indicative quantity

Monitor and analyze meteorological data

Confirm regional assessments with specific studies of target watersheds

Manage wells, well fields and watersheds

Monitor extraction, water level and quality

Thank you for your attention