

May 3, 2019

The Challenge of Water on Guam: Balancing Supply, Demand, and Water Resource Policy

Michelle Sorensen PE,
PEng

2019 PNWS – AWWA Conference Vancouver,
WA



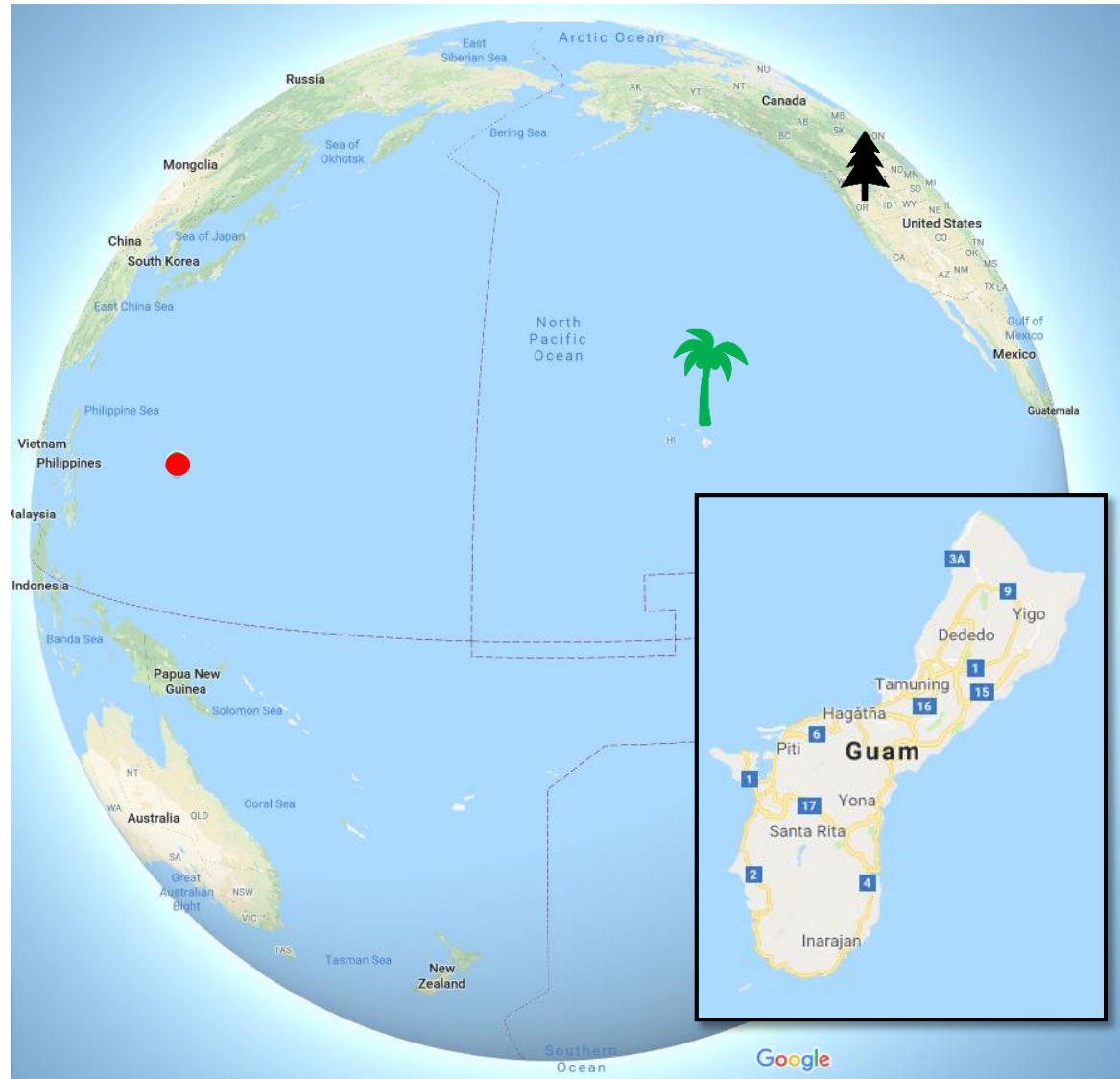
Agenda

1. Introduction
2. The basics: geology, supply and demand
3. Land development over the Northern Guam Lens Aquifer
4. Water supply in South Guam



Guam

- US Territory
- 165,000 people
- 3,800 miles west of Oahu
- 30 x 10 miles
- Rainy season
July to October
- Economy
 - Tourism
 - Military



Canada, land of water in many forms







National Labor Policy

Guam businesses struggle as H-2B foreign workers dwindle

Haidee V Eugenio, heugenio@guampdn.com Published 4:00 p.m. ChT Aug. 23, 2017 | Updated 4:18 p.m. ChT Aug. 23, 2017

H-2B issues delaying local projects

Jerick Sablan, jpsablan@guampdn.com Published 2:43 p.m. ChT Jan. 21, 2018 | Updated 4:50 p.m. ChT Jan. 21, 2018

**OVERHAULING THE
TEMPORARY FOREIGN WORKER
PROGRAM**

PUTTING CANADIANS FIRST

Geographic Isolation



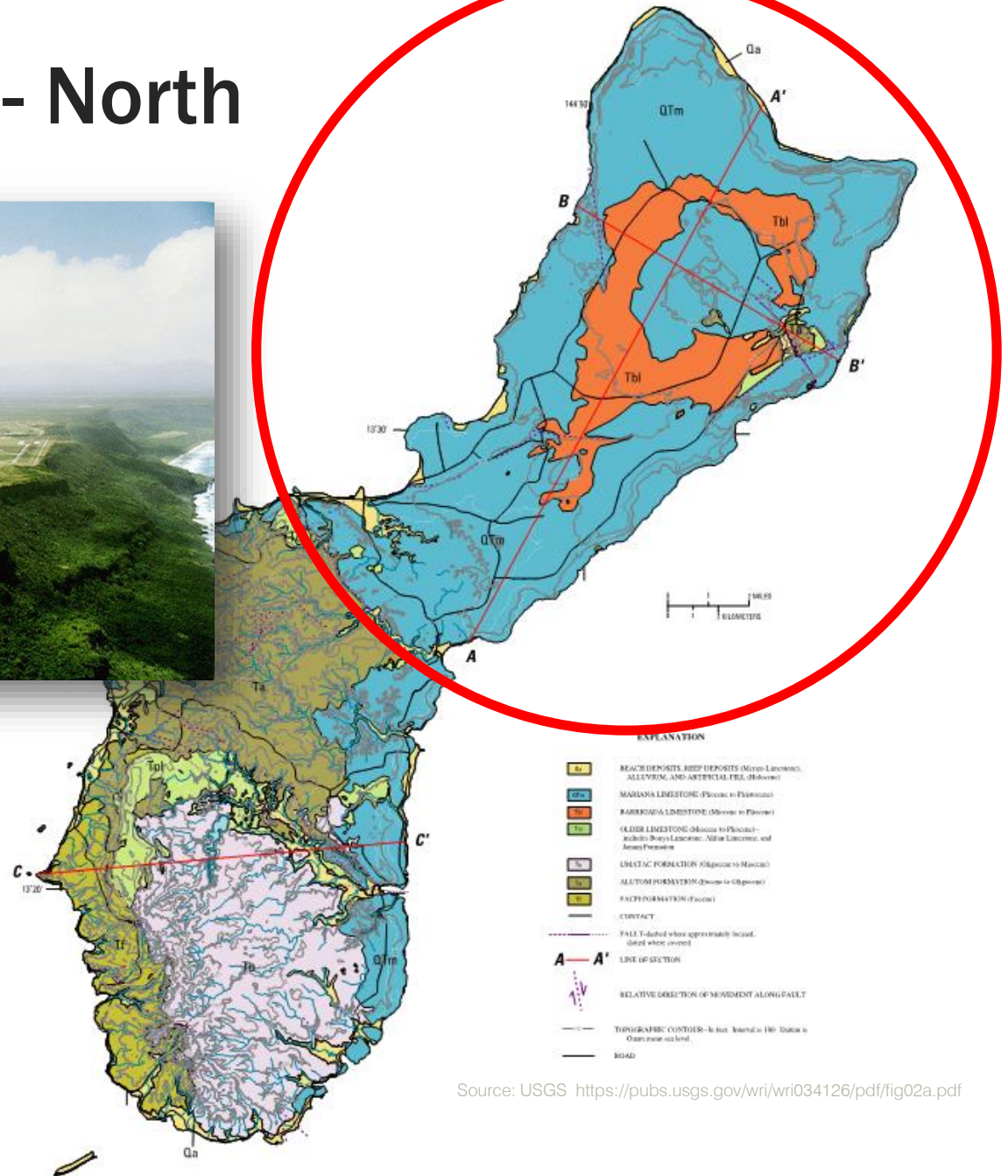
Water Issues make Headlines

Guam fails south again



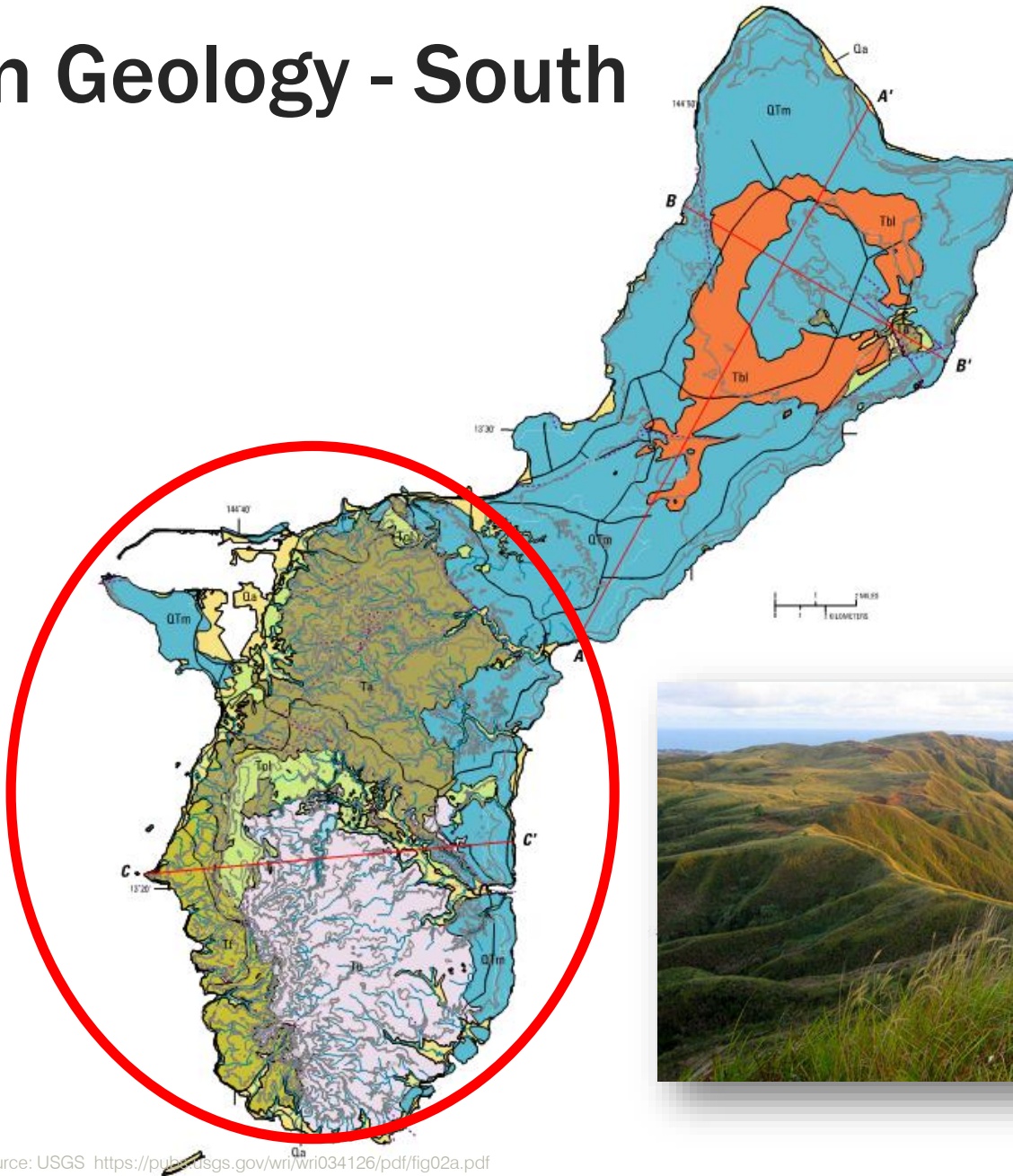
SNAPSHOT: Water Resources on Guam

Guam Geology - North



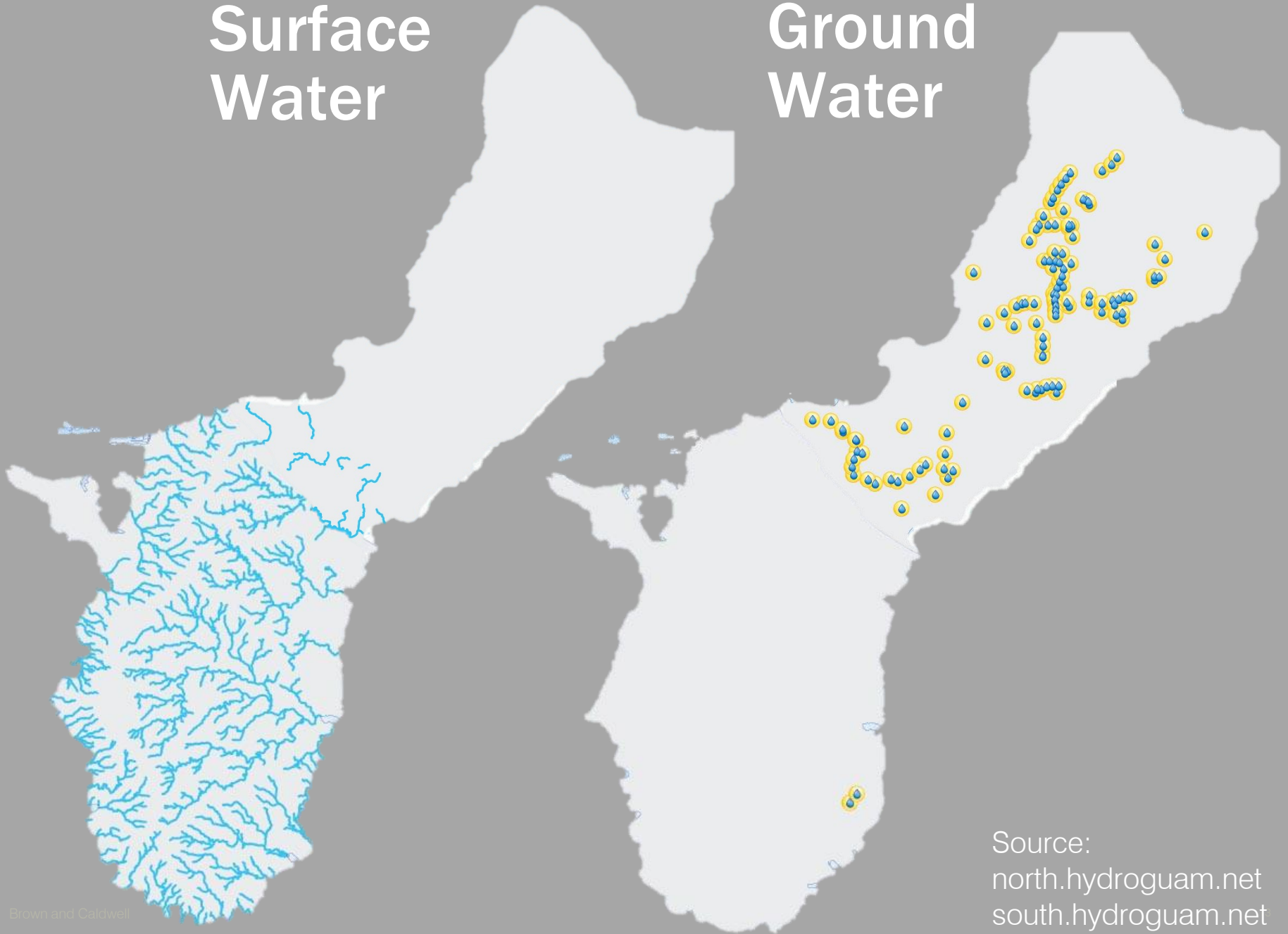
Source: USGS <https://pubs.usgs.gov/wri/wri034126/pdf/fig02a.pdf>

Guam Geology - South



Surface Water

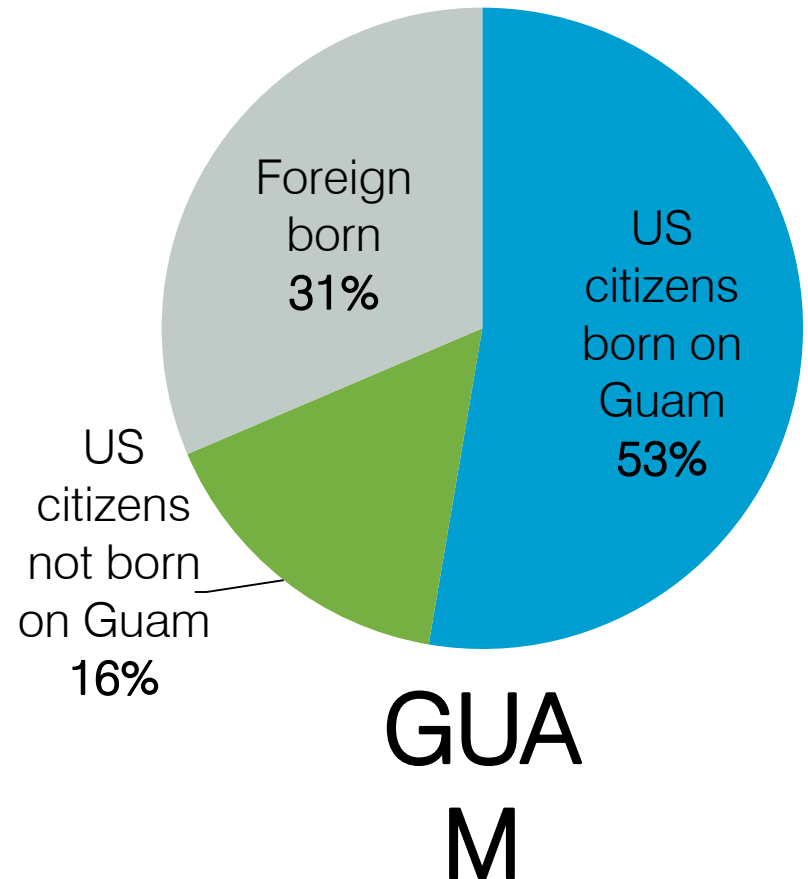
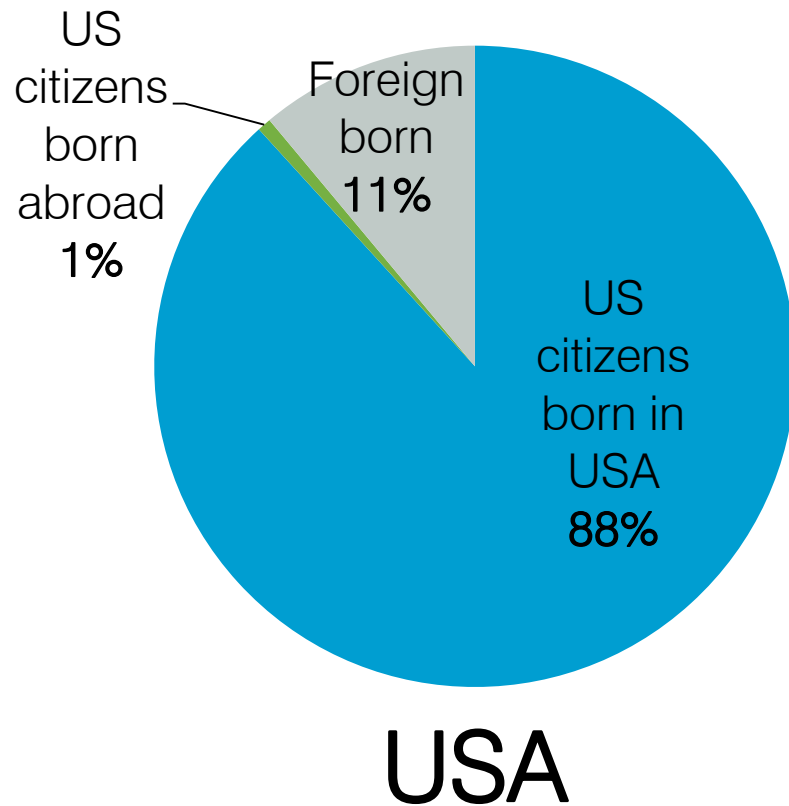
Ground Water



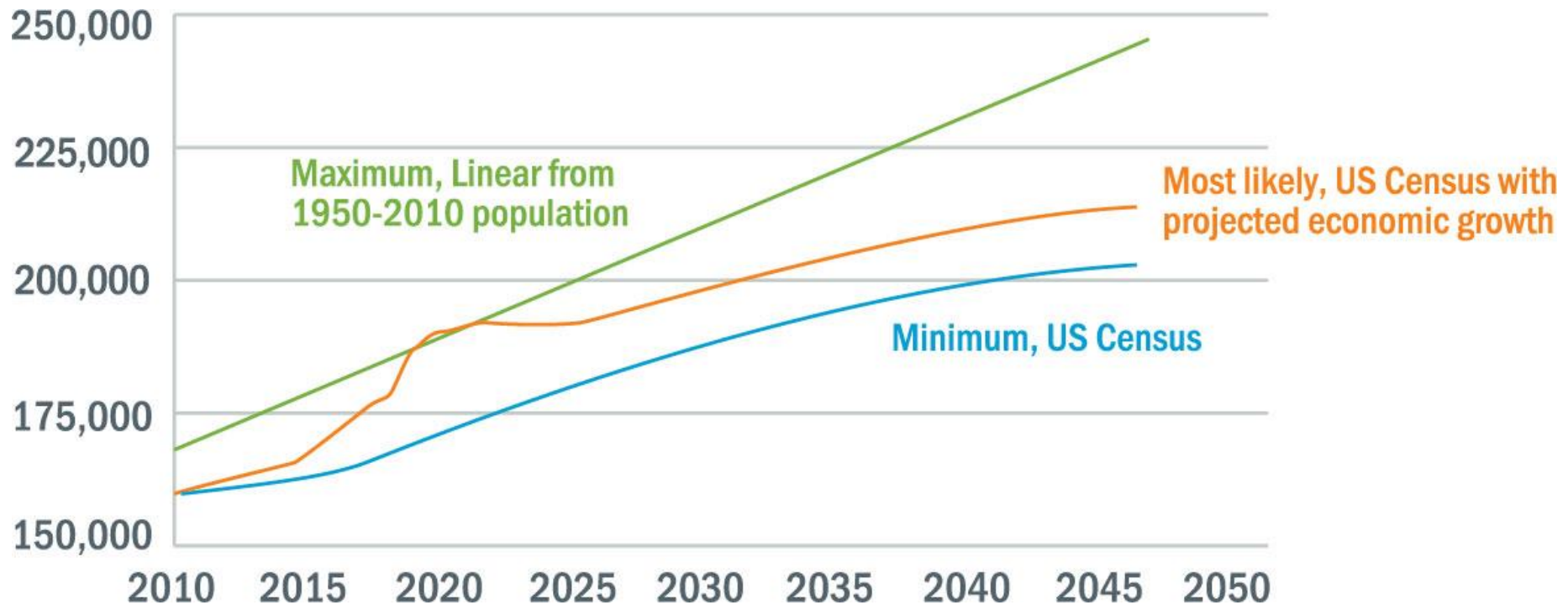


The Basics – Predicting Demand

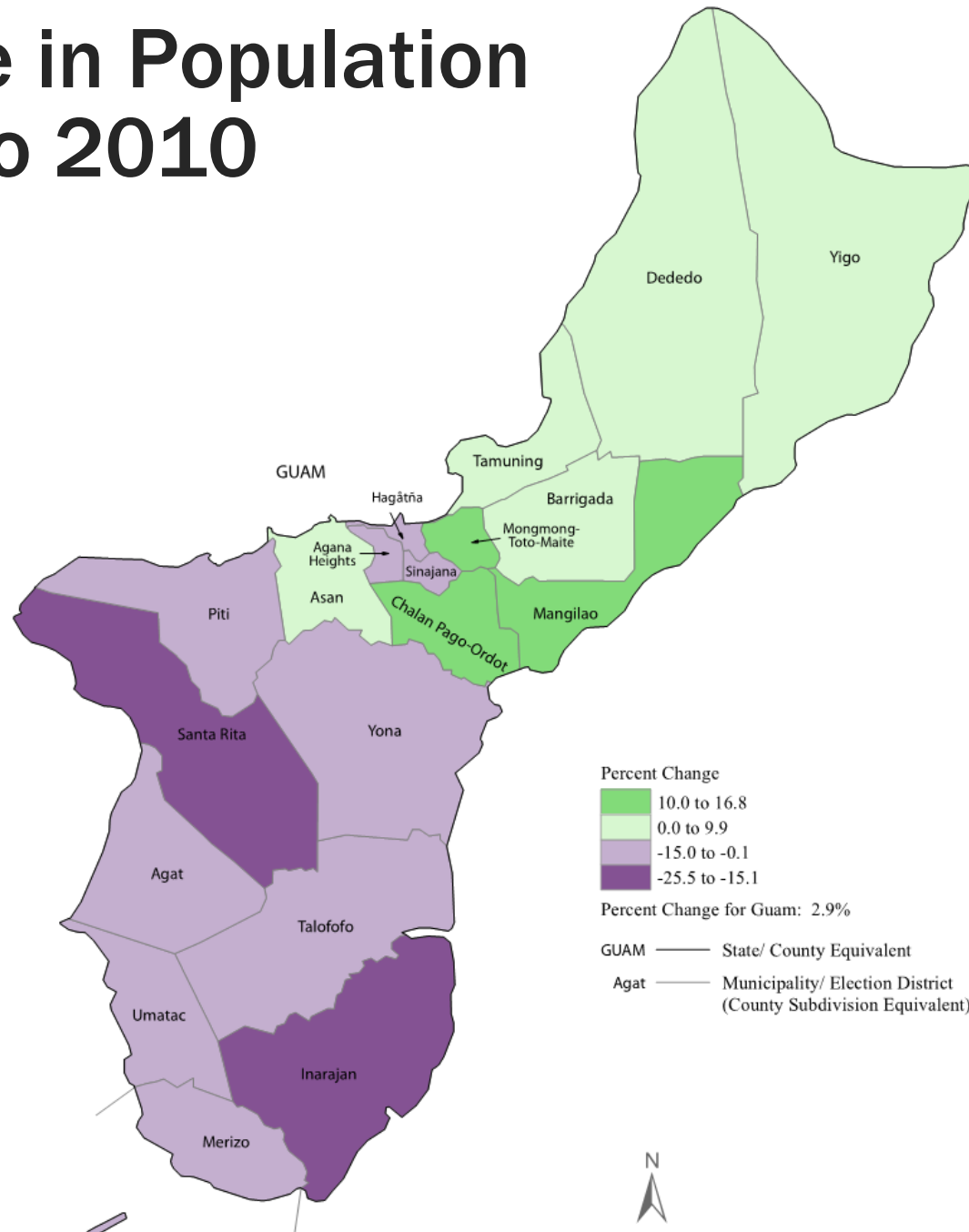
Guam and US Population Comparison



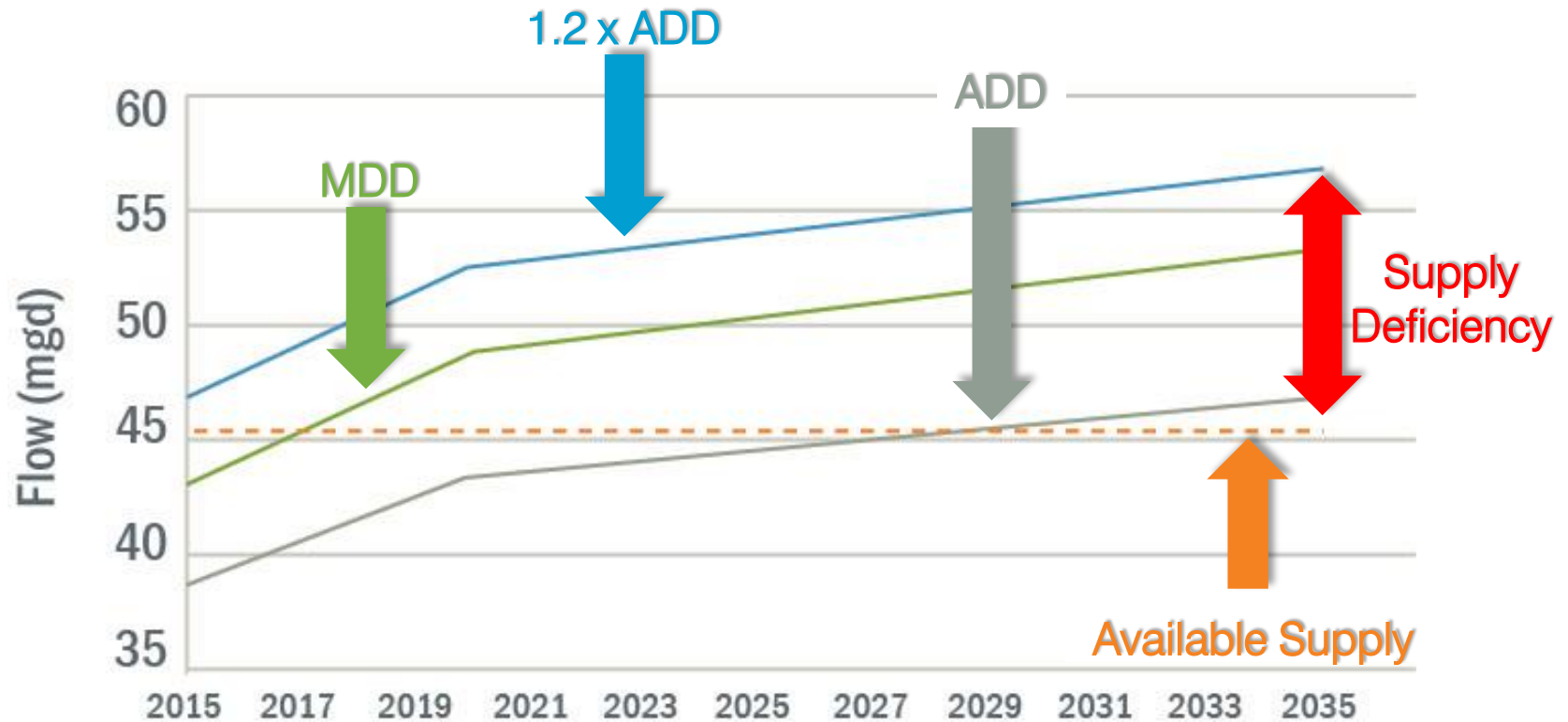
Population Projections



Change in Population 2000 to 2010



Supply and Demand



Water Supply Options

New well
development in
the North



Redevelopment of
historic sources



Conservation and
reduction of NRW



New springs or
surface water
development



Utilization of Navy
water (Fena and
OneGuam)





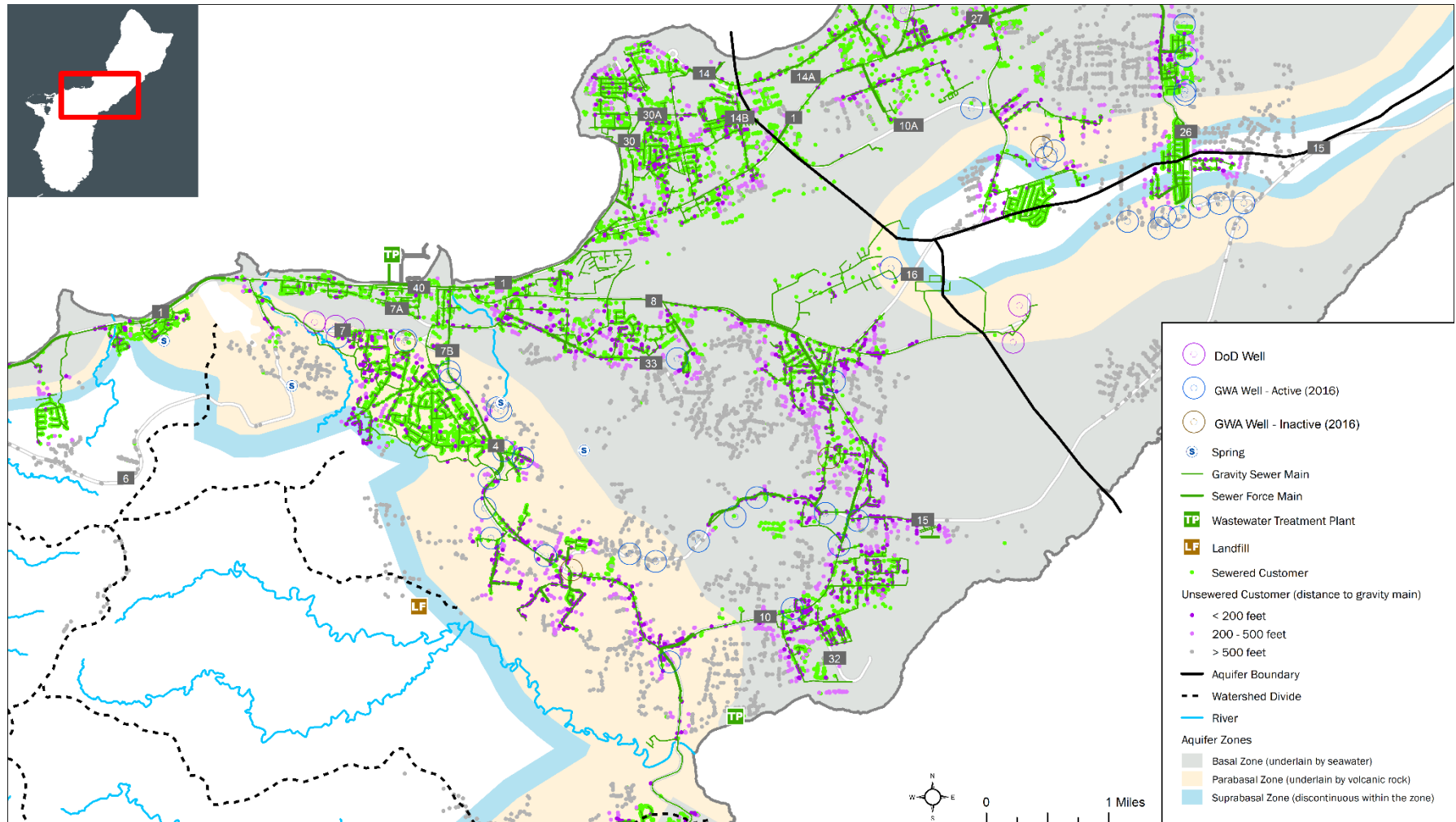
Aquifer Protection - Land Use over the Northern Guam Lens Aquifer (the “NGLA”)

“Water links us to our neighbor in a way more profound and complex than any other.”

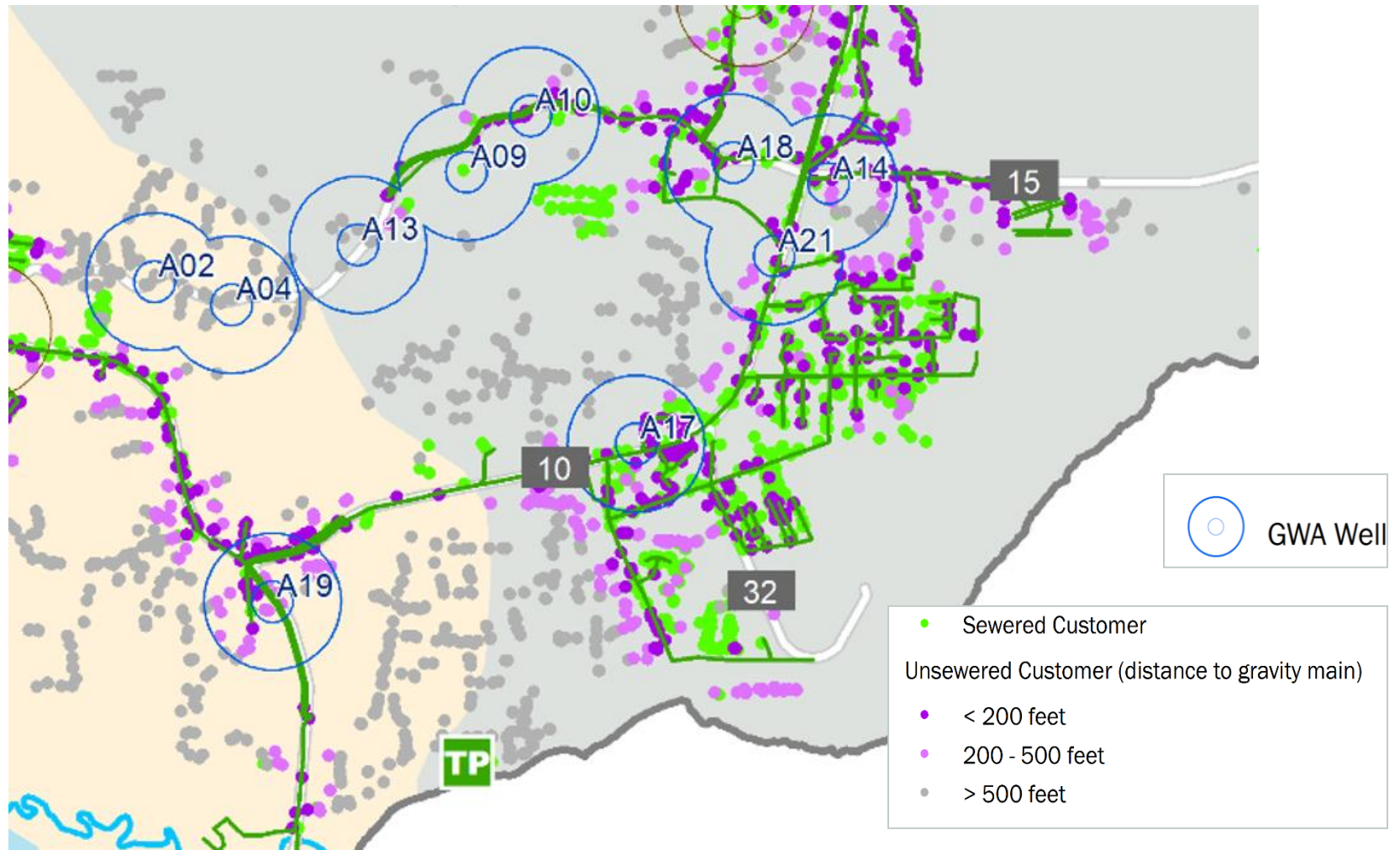
John Thorson

Water Law & Policy Attorney

Water Quality Protection: Unsewered areas over the NGLA



Unsewered areas over the NGLA



Source Water Protection

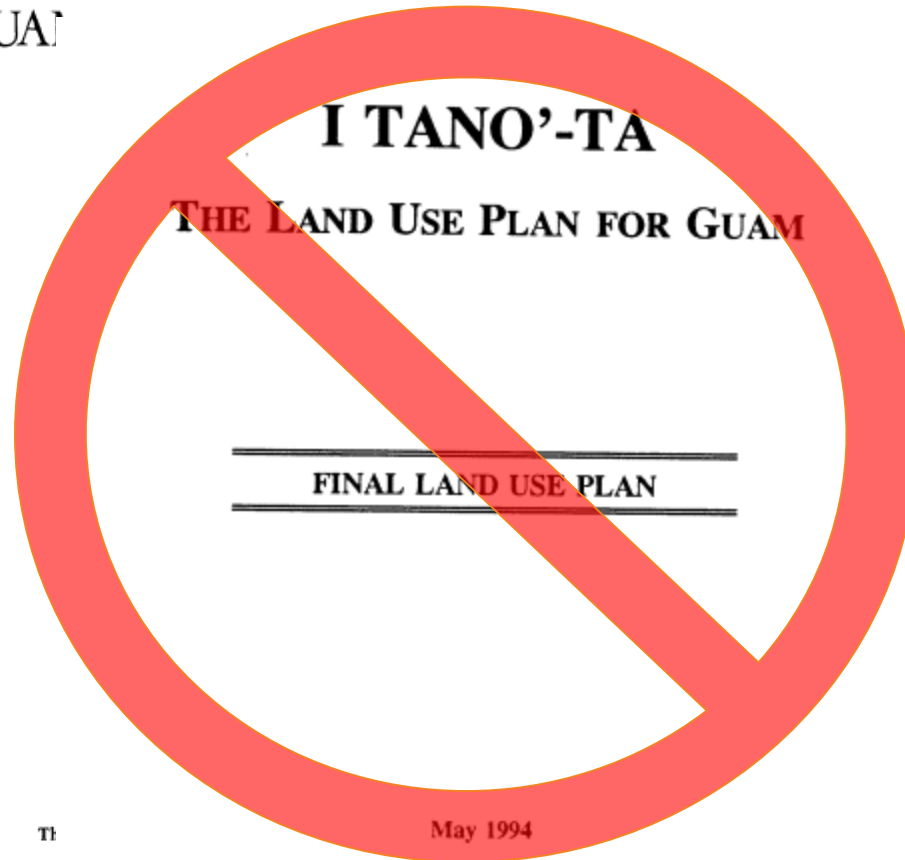
Wellhead Protection Plan Recommendations

- Enforce existing zoning requirements
- Enforce water resources protection regulations
- Educate the public
- Install additional groundwater monitoring
- Implement land use planning strategies



Land Use Plans on Guam

GUAM



TI

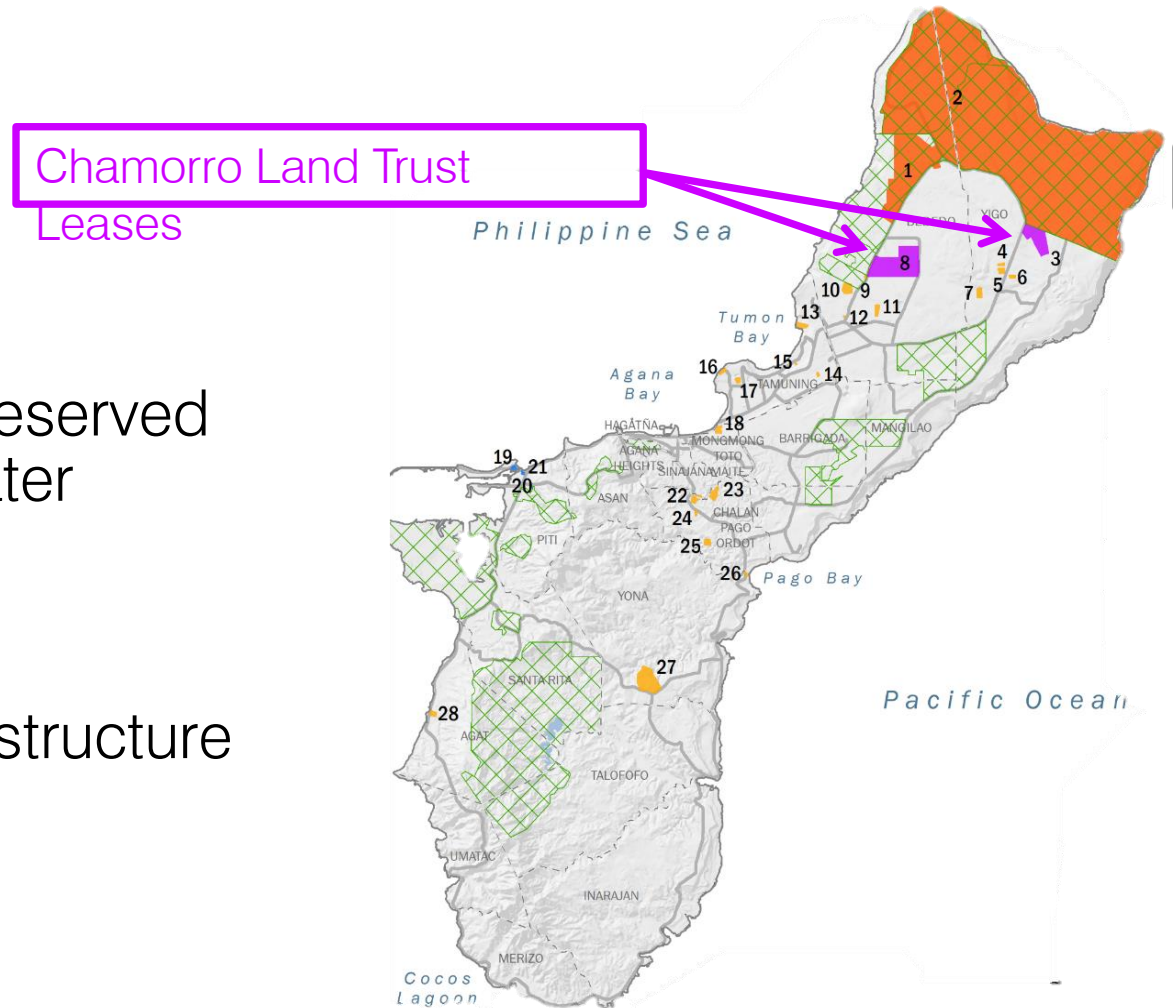
Prepared for:

THE TERRITORIAL PLANNING COUNCIL

September 2009

Projected Development

- Unsurveyed
- Land not necessarily reserved for water and wastewater infrastructure
- 1/2 acre lots sizes
- Responsibility for infrastructure installation



Water Resources Policy for North Guam

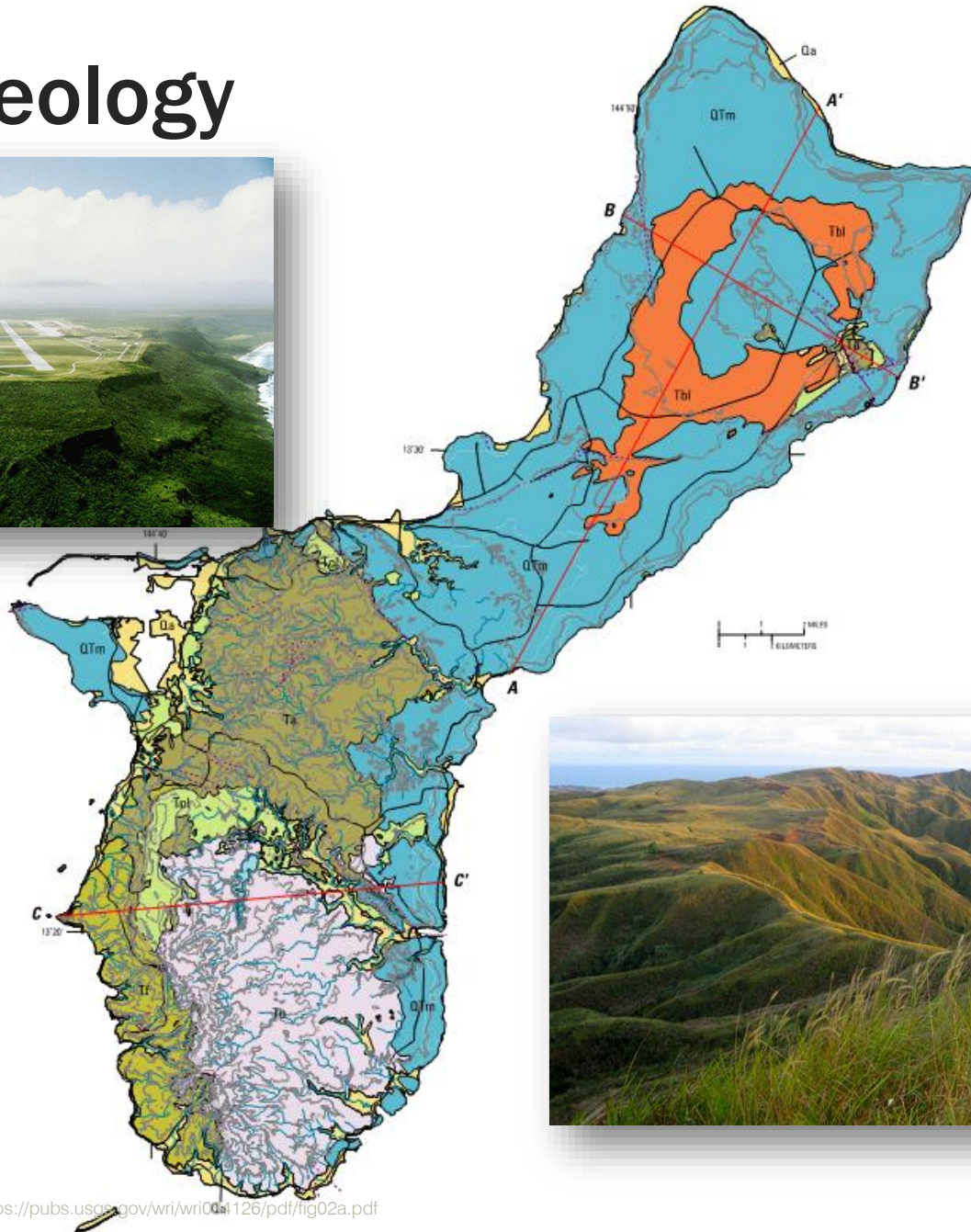
- Enforcing connection of unsewered properties that fall within 200 ft of an existing sewer line... and fixing leaky collection pipes as unsewered areas are connected?
- Without a LUP, long term planning for aquifer protection and system expansion is more challenging
- CLT leases are being awarded – who will pay to expand the necessary services?





Water Supply in South Guam

Guam Geology



**“Still waters run deep. Shallow waters
run dry frequently.”**

Thomas County Cat

Ugum River Flows

“Too much?”



“Too little?”



Uplands Erosion Susceptibility



Jeep Trails



Badlands



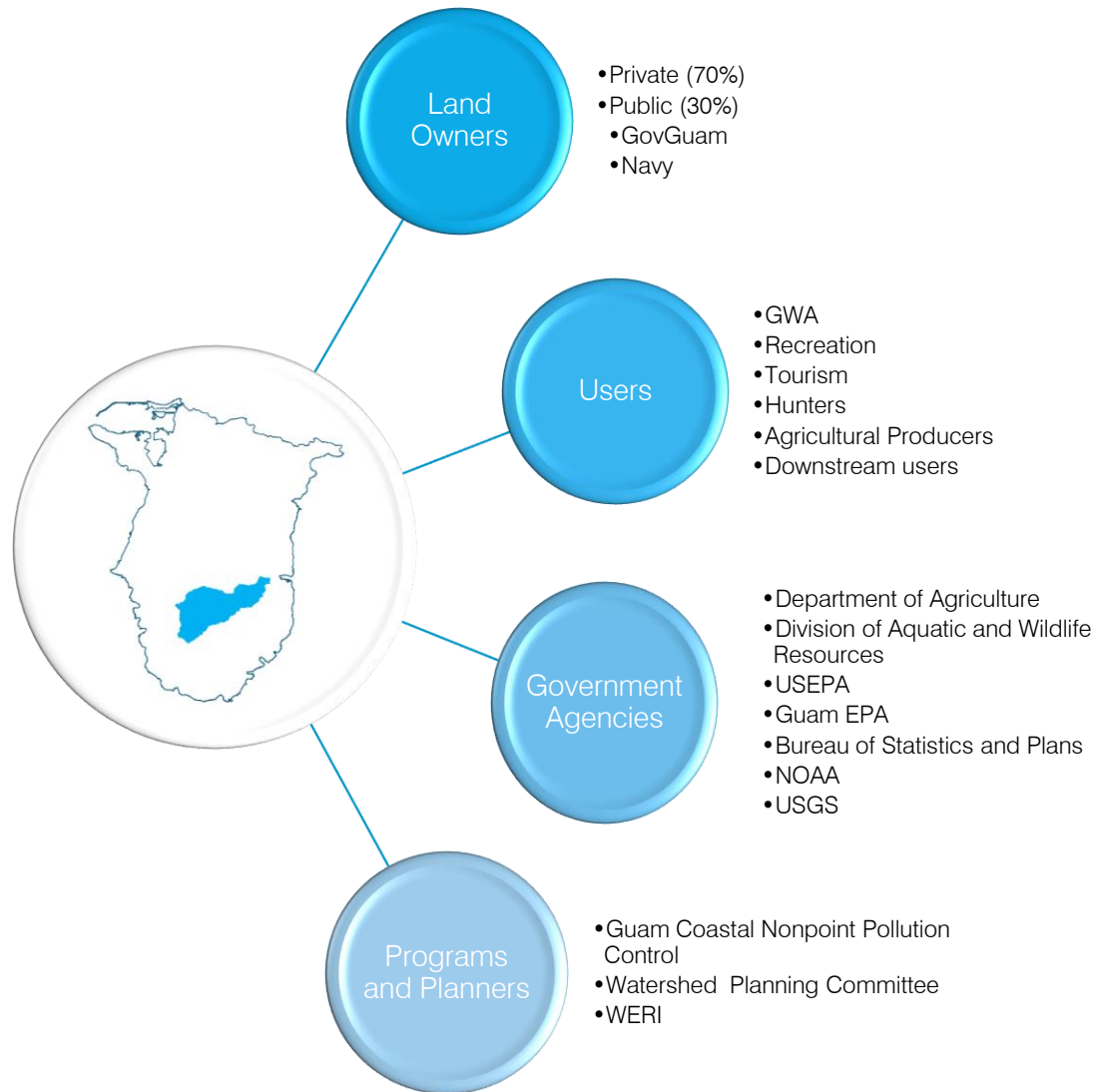
Wildfire
Areas



Ungulate
Habitat

Photos:
south.hydroguam.net,
guamyoungchampions.blogspot.com

Ugum Watershed Policy - Stakeholders



Water Resources Policy - Summary

South Guam



1. Ugum Watershed Plan
2. South Guam Water Strategy

North Guam



1. Connection of unsewered properties
2. Need for an accepted LUP
3. Expansion of water and wastewater services into developing areas

What we **HAVE NOT** talked about

- Sustainable management of the NGLA
- Single water utility for Guam
- Non-revenue water
- Climate-related issues






Thank you.
Questions?



The Mystery of Ugum

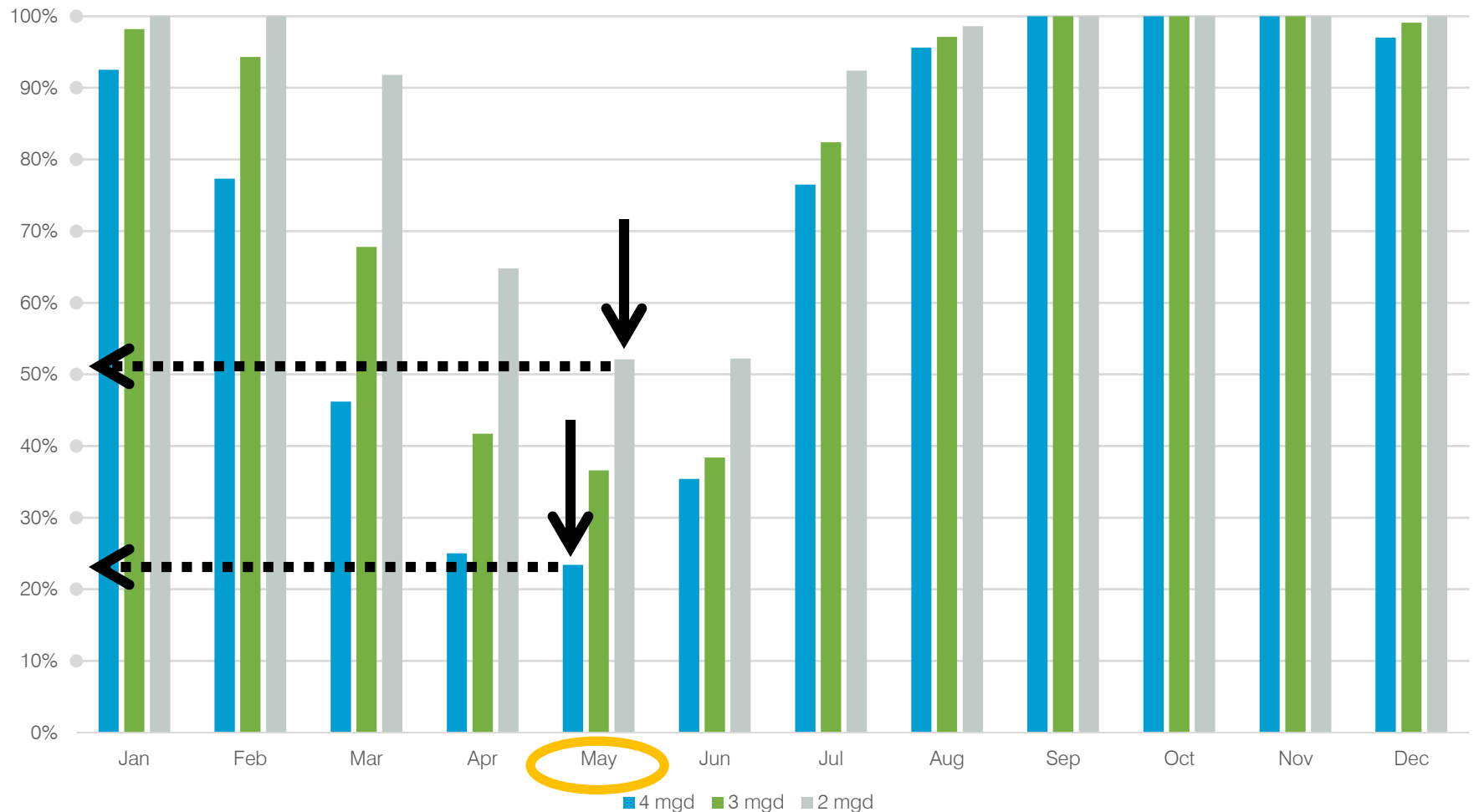
Ugum River Minimum Stream Flow Requirements (?)	
Minimum Environmental Stream Flow (ft ³ /s)	Source
	GWA (2006), USDA (1995)
	USGS min flow on record (1977-2016) ¹
	EIA/GEPA requirement for UWTP ²
	7Q10 (2016)

¹ USGS stream gauge 16854500 1.5 miles upstream.

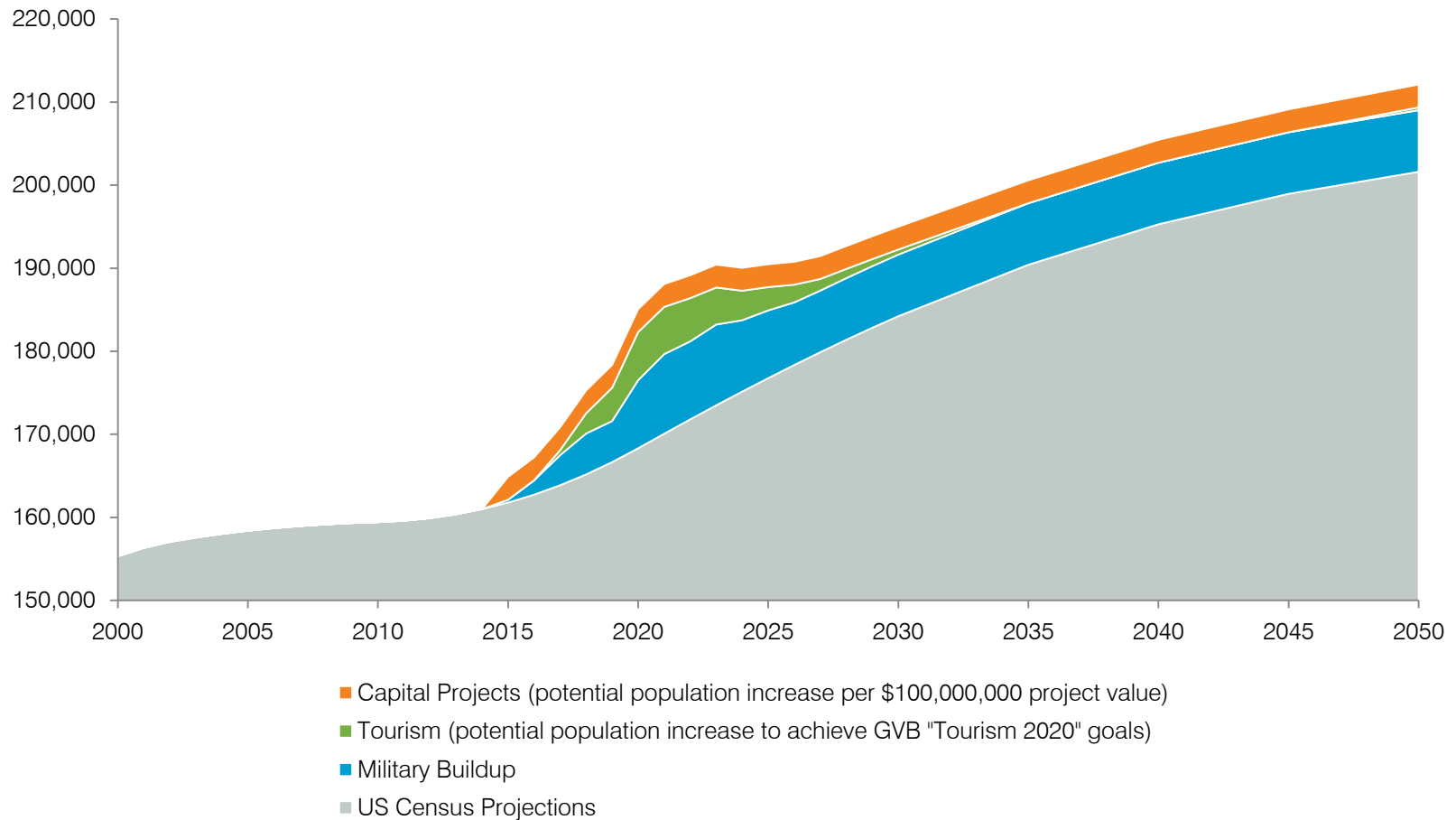
² Original documentation could not be located, this number is unverified.

Water Production Capacity

Ugum River Minimum Remaining Flow 3.5 cfs



Population Projections



Damage in Yigo continues, mayor cites burnt motor vehicles idents airs; GWA

Pacific Daily News

Published 1:12 p.m. ChT Oct. 23, 2017 | Updated 2:37 p.m. ChT Oct. 23, 2017

17 (2)

\$3.7 million well project to prepare for buildup

John I Borja, jborja@guampdn.com

Published 4:00 p.m. ChT Sept. 4, 2017

Editorial

It's inhumane to it, GWA

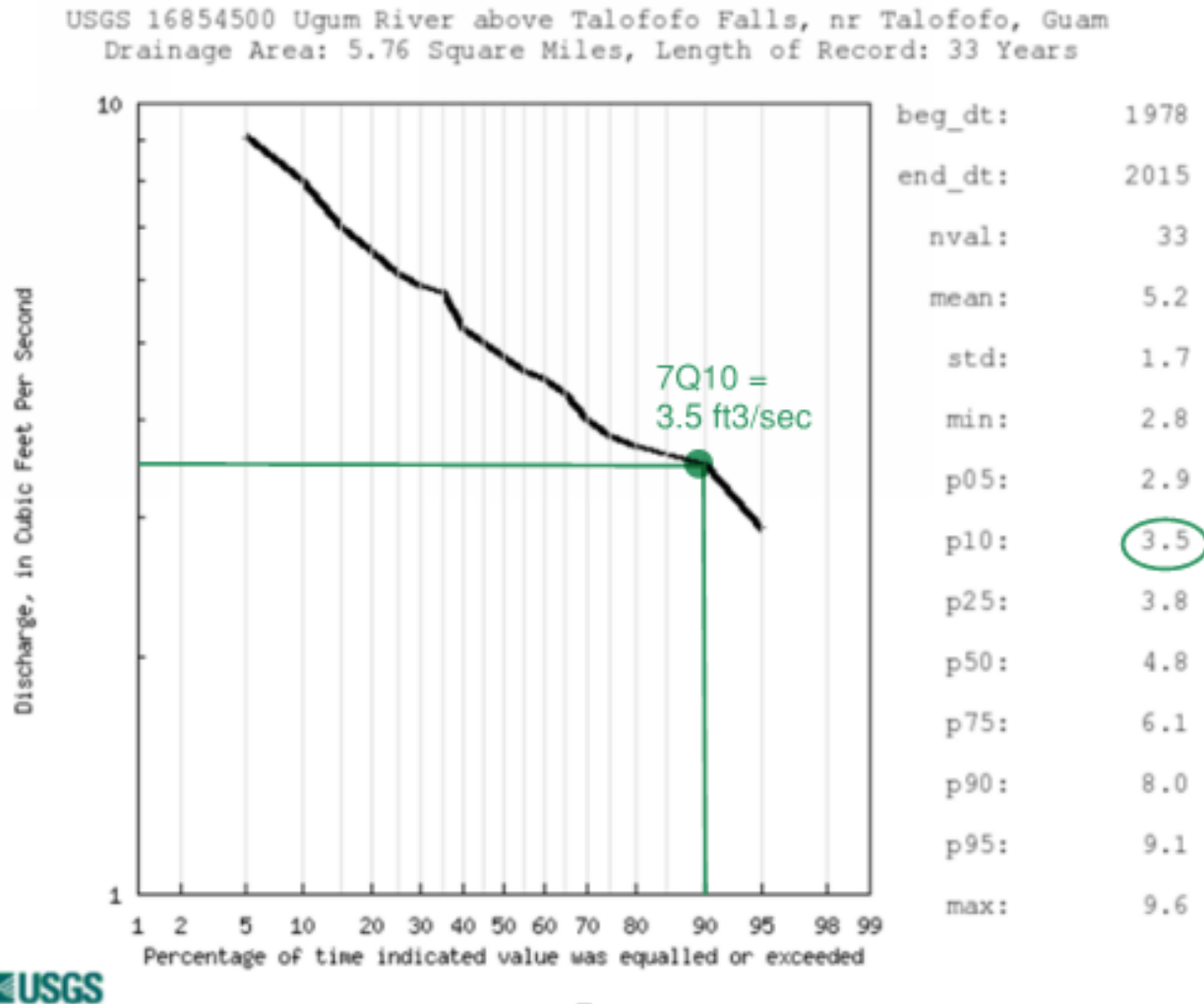
The Guam Daily Post Aug 27, 2017 (0)

The Guam Daily Post Nov 3, 2017 (1)

Water issues hit 2 southern villages

Louella Losinio | The Guam Daily Post Sep 10, 2017 (2)

Ugum River 7-day Minimum Average Flows (1978-2015)



Water Production Capacity

Ugum River Minimum Remaining Flow 2.0 cfs

