Groundwater Management utilizing a Safe Yield Range tool

Presented by

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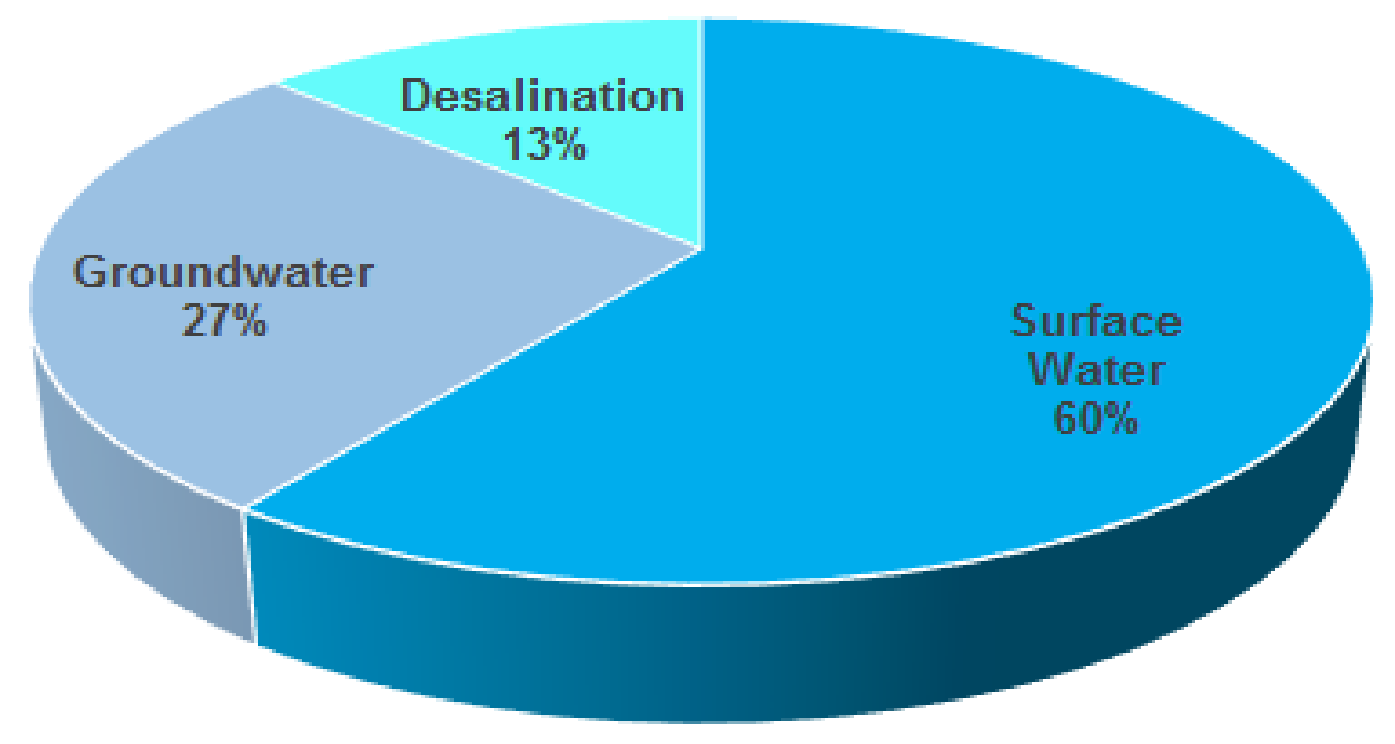
Introduction

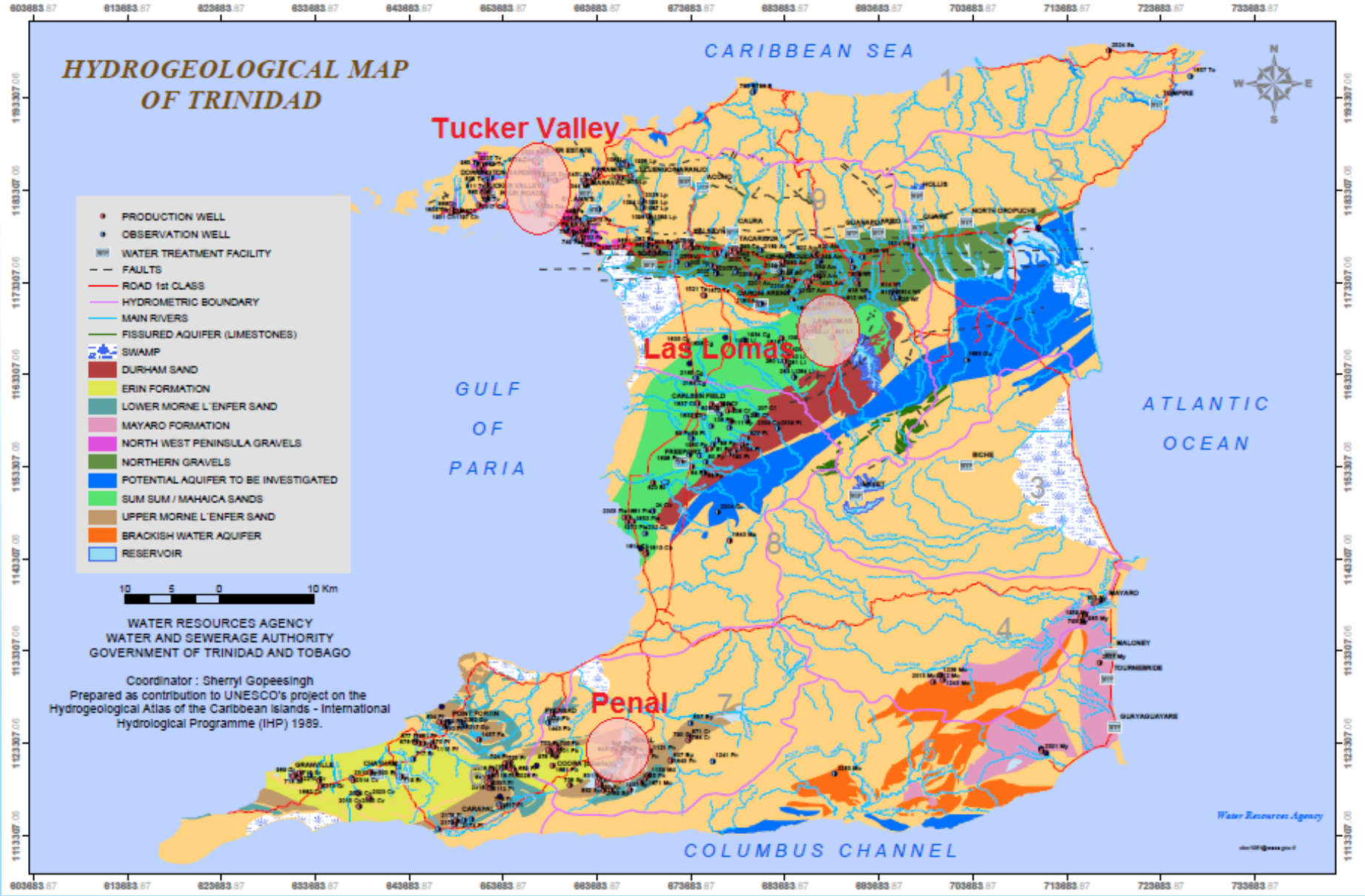
Trinidad and Tobago

- 1.3 million (CSO, 2013) population
- Industrialized – Oil and gas
- Agriculture / tourism / manufacturing

Water Supply



Background


HYDROGEOLOGICAL MAP OF TRINIDAD
CARIBBEAN SEA
Tucker Valley
Las Lomas
Penal
GULF OF PARIA
ATLANTIC OCEAN
COLUMBUS CHANNEL
PRODUCTION WELL
OBSERVATION WELL
WATER TREATMENT FACILITY
FAULTS
ROAD 1st CLASS
HYDROMETRIC BOUNDARY
MAIN RIVERS
FISSURED AQUIFER (LIMESTONES)
SWAMP
DURHAM SAND
ERIN FORMATION
LOWER MORNE L'ENFER SAND
MAYARO FORMATION
NORTH WEST PENINSULA GRAVELS
NORTHERN GRAVELS
POTENTIAL AQUIFER TO BE INVESTIGATED
SUM SUM / MAHAICA SANDS
UPPER MORNE L'ENFER SAND
BRACKISH WATER AQUIFER
RESERVOIR
10 5 0 10 Km
WATER RESOURCES AGENCY
WATER AND SEWERAGE AUTHORITY
GOVERNMENT OF TRINIDAD AND TOBAGO
Coordinator : Sherryl Gopeesingh
Prepared as contribution to UNESCO's project on the Hydrogeological Atlas of the Caribbean Islands - International Hydrological Programme (IHP) 1989.
Water Resources Agency

Methodology

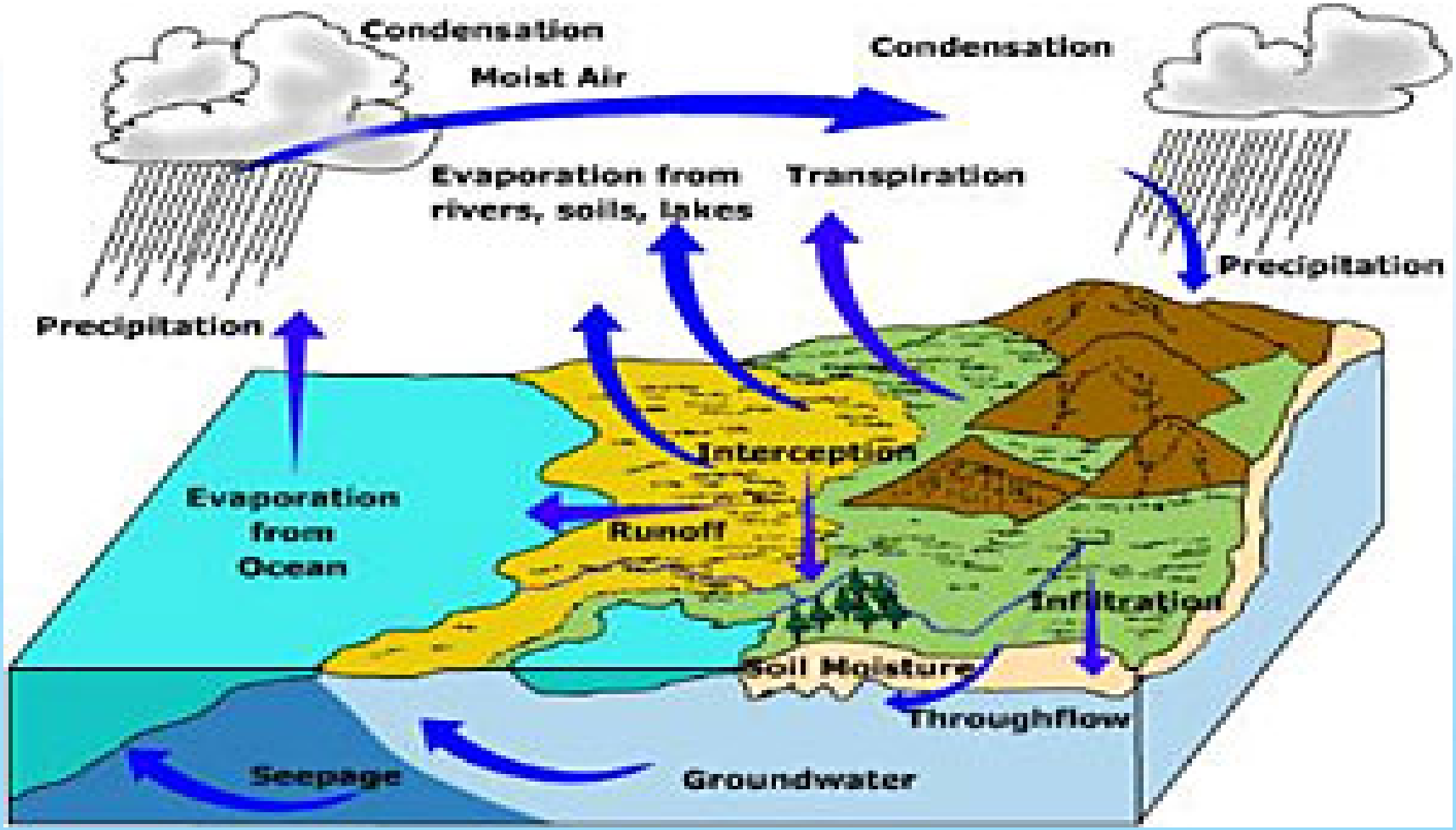
- Methods for estimating recharge include:
  1. Water Table Fluctuation and Abstractions (Groundwater Method)
  2. Rainfall Infiltration (Water Budget Method)
  3. Recession Curve Displacement (Streamflow Method)
  4. Infiltration factors (Groundwater Method)
  5. Empirical relationship (Groundwater Method)

- Water Table Fluctuation and Abstraction examines the fluctuation of water level trends based on abstraction

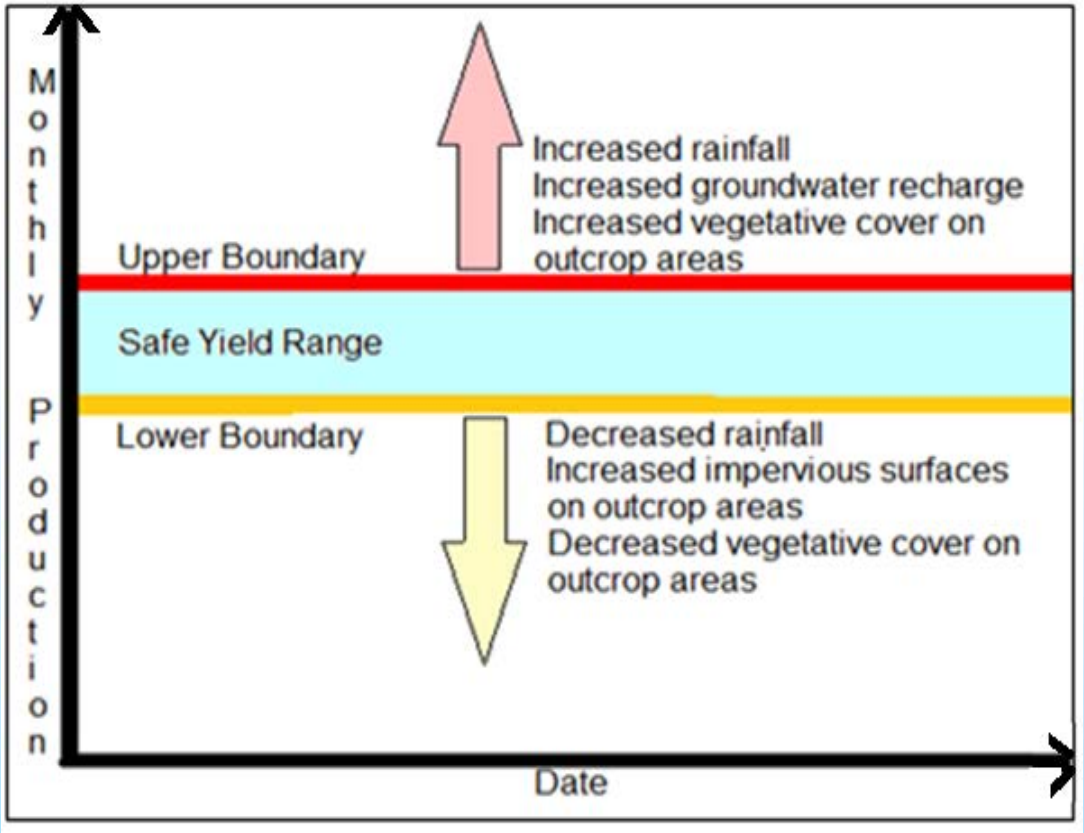
- Rainfall Infiltration is an accounting method comprising input and output factors

Safe Yield

- The Safe Yield of an aquifer is usually expressed as a percentage of recharge



Safe yield range



- Provides an upper and lower boundary for the withdrawal of water from an aquifer system without hazardous depletion of the stored reserve and or deterioration of the water quality or causing unacceptable environmental, economic or social consequences

- Uses several methods depending on the aquifer type, aquifer parameters and historic data availability is permissible
- Reassess every three years

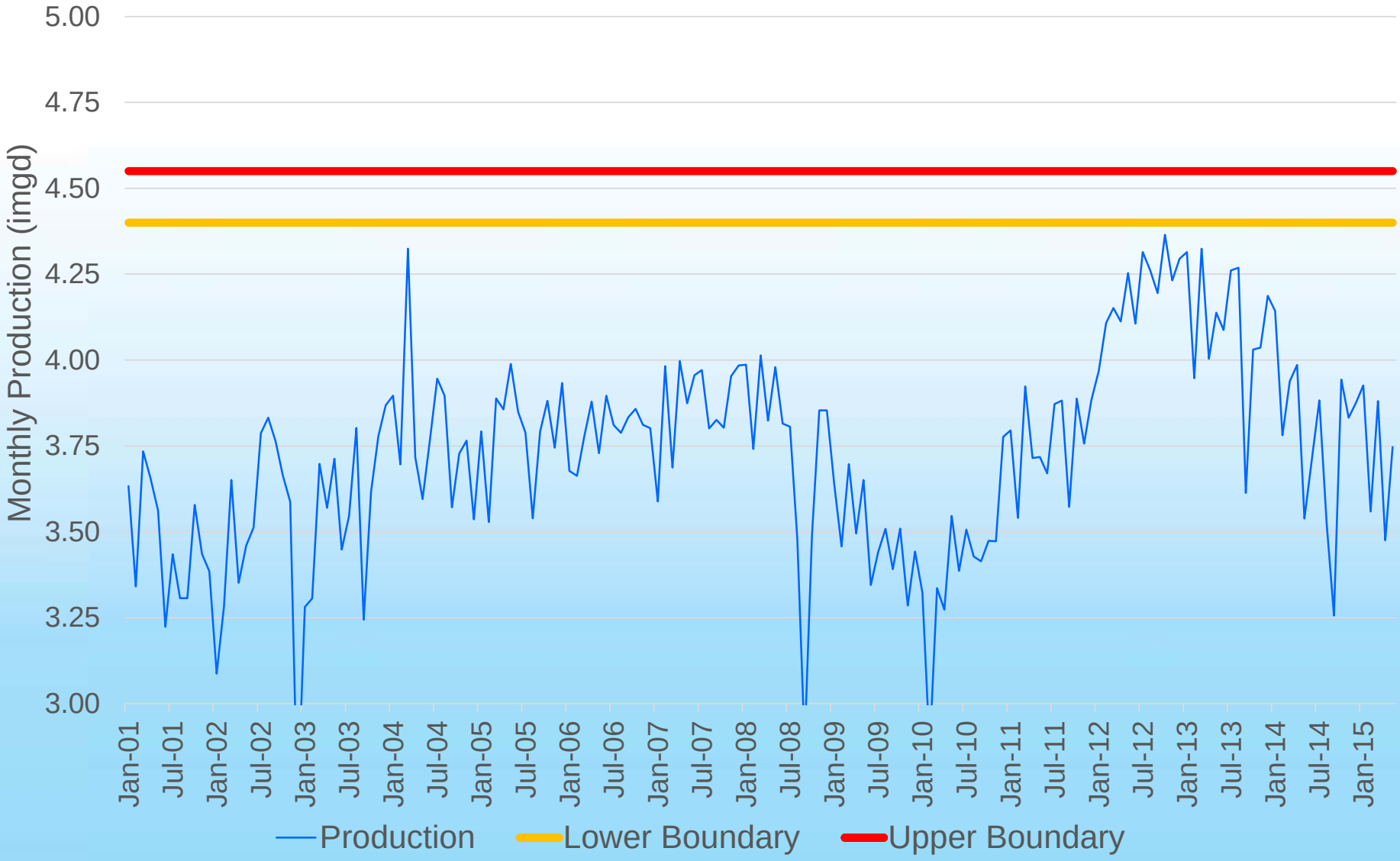
Results

Wellfield	Rainfall Infiltration (Water Budget Method) (imgd)	Water Table Fluctuation and Abstraction Method (imgd)
Tucker Valley	**4.55**	**4.40**
Las Lomas	**1.76**	**1.59**
Penal	**0.64**	**0.71**

- Reasonable results
- Applicable to gravel and sand aquifers
- Assurance and reliability

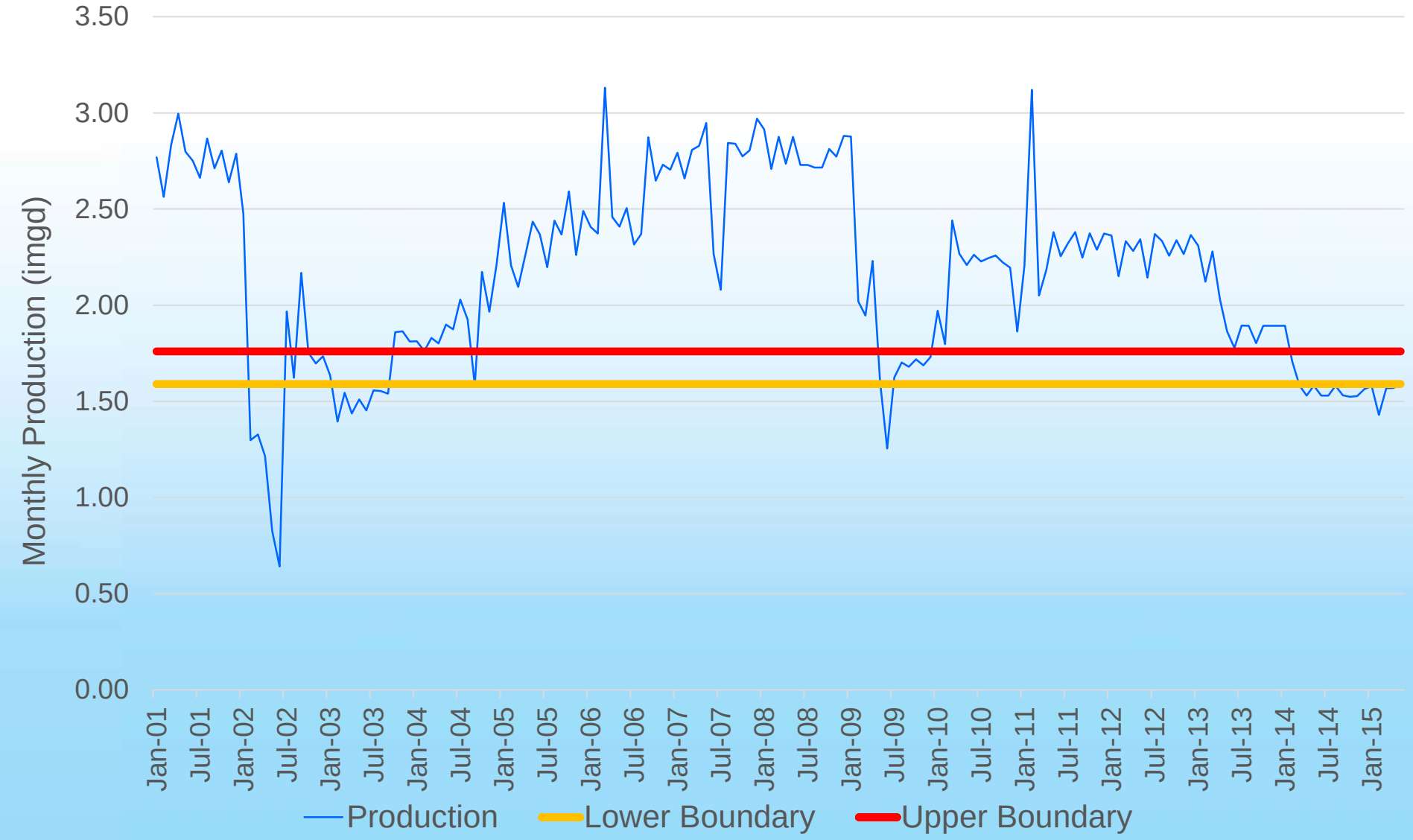
Tucker Valley

(Period January 2001 - May 2015)



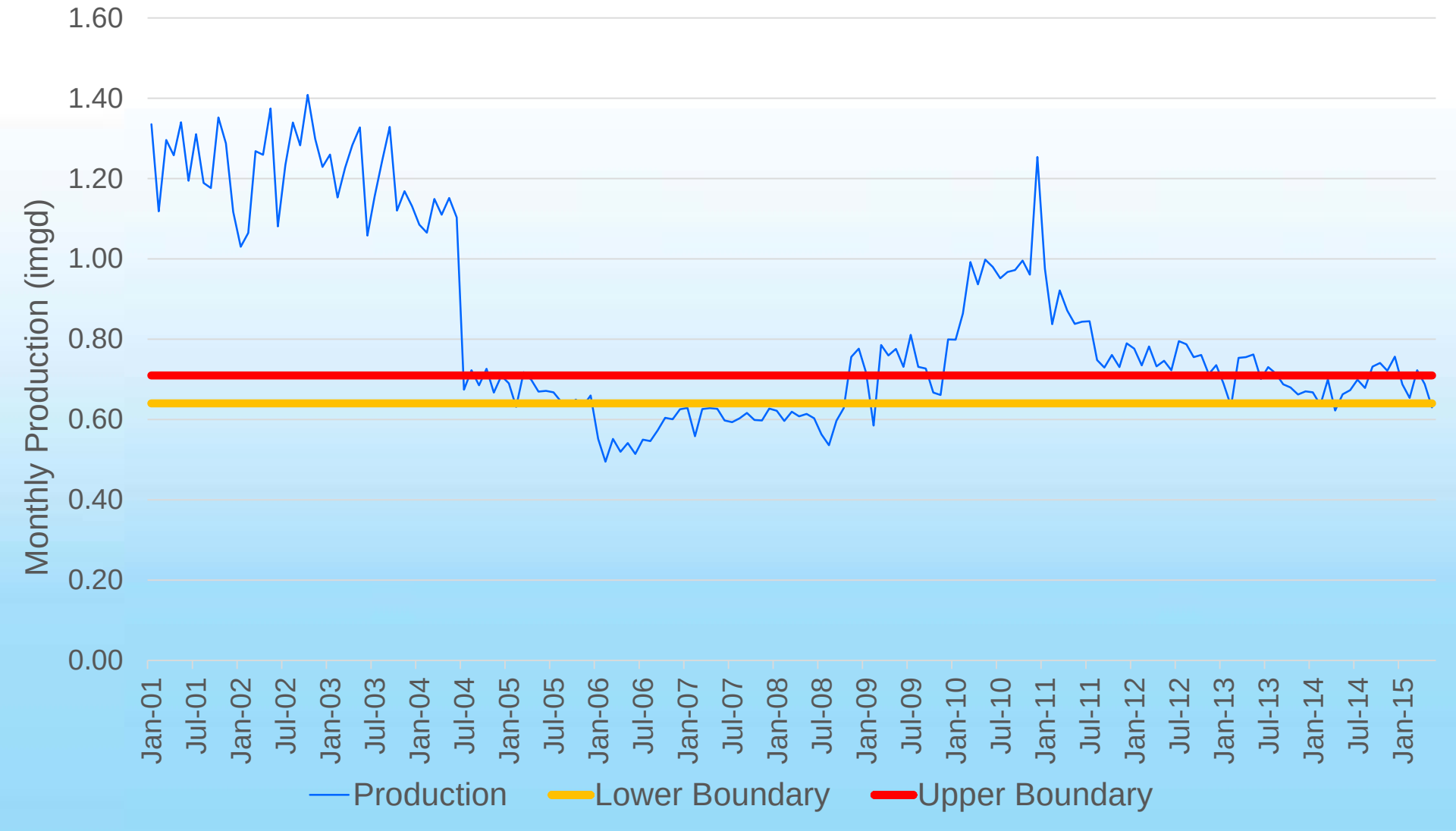
Las Lomas

(Period January 2001 - May 2015)



Penal

(Period January 2001 - May 2015)



Benefits of the Safe Yield Range Concept

- ✓Strikes a balance between groundwater development in aquifers with additional potential and reducing abstraction rates in over-pumped aquifers
- ✓Employs the upper boundary to give an indication of a maximum acceptable rate that water can be abstracted, in times of emergency and surface water shortages
- ✓Leaves room for year to year changes in hydrological parameters
- ✓Takes into account the Precautionary Principle from the National IWRM Policy

Conclusion

- Provides regulatory boundaries where abstraction should be maintained to preserve the reliability of the aquifer system is innovative yet has a built-in cautionary mechanism

- Employs more than one technique to obtain recharge reassures the protection of the aquifer system

- Guarantees adequate planning as it fits into groundwater management meticulously, it corroborate implementation and operation while maintaining safe and reliable groundwater supplies

Thank you

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